

RESTORING ACTIVE BLANKET BOG IN IRELAND

Project reference: LIFE02NAT/IRL/8490

A REPORT ON THE RESTORATION OF PROJECT SITE No. 11.
SHANVOLAHAN, CO. MAYO.



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Project Site No. 11 – Shanvolahan, Co. Mayo**1. Introduction**

Grid reference G 070 203	Elevation (m) 65 to 75	Bedrock geology Sandstone
SAC Name and number Bellacorrick Bog Complex (1922)	Site area (ha) 76.6	Main restoration methods Commercial removal of conifer crop. Fell to waste of conifer crop, wind-rowing and drain-blocking.
Area of conifer cover (ha) 64.3	Area of open bog (ha) 12.3	
Noteworthy plant/animal species occurring <i>Vaccinium oxycoccus</i> , <i>Tomenthypnum nitens</i>		

Shanvolahan is located in the north-west of Co. Mayo, approximately 10 kilometres west of the village of Crossmolina. The site occupies an area of 76.6 hectares, 64.3 of which consisted of conifer plantation of varying size and age. The entire project area lies 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. This SAC is notable for the widespread occurrence of flush and fen vegetation, derived from mineral-rich groundwater seepage areas. These flushed areas are known to support a number of nationally and internationally rare vascular plant and moss species.

Although the majority of the land within this site was planted with conifers there are also small areas of open blanket bog which were left unplanted because of their very wet, pool-studded nature. In addition to ombrotrophic blanket bog with pools there is also an area of flushed peat which supports fen vegetation in which *Molinia caerulea* and *Cladium mariscus* are prominent. The area immediately to the east of the property is dominated by very wet, intact blanket bog of high ecological value. Although this peatland area does lie within the project area it was crucial that any restoration activities, such as drain-blocking, did not result in damage to this ecologically sensitive adjoining area.

At this site 39 hectares of commercial quality conifers were felled and removed by machine while in the eastern half of the site the young/low-yielding conifers were felled manually and wind-rowed. Following tree felling/removal any significant artificial drains were blocked.

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.

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.



Within this site there are a number of small open areas of wet bog which were not planted with trees, presumably due to their extreme wetness. Bog pools are numerous and most are colonised by *Menyanthes trifoliata* and *Sphagnum cuspidatum*.



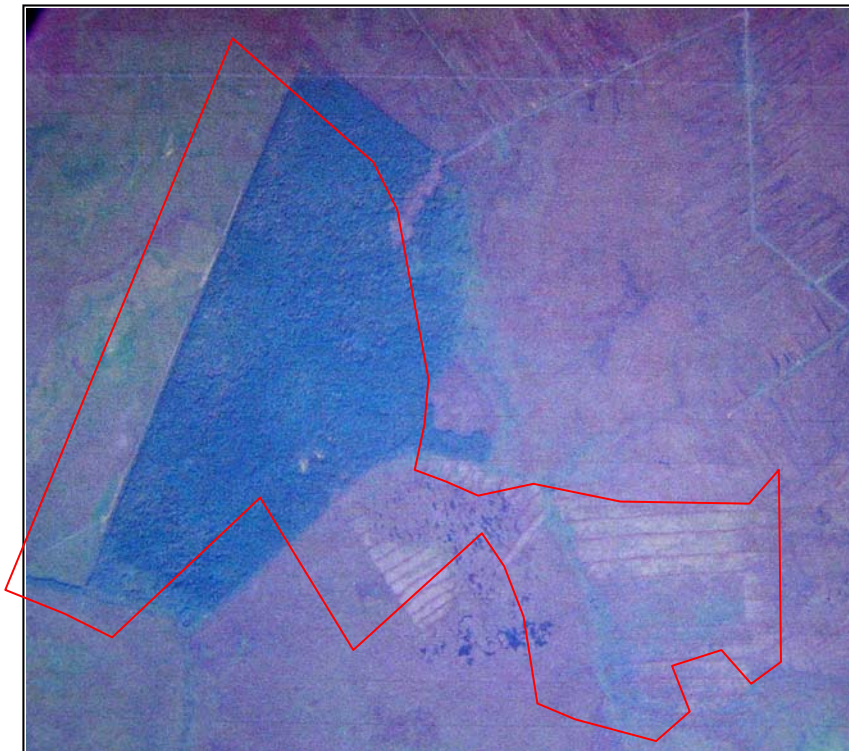
At the north-western end of this site a commercial crop of lodgepole pine was harvested. A low hillock in this area has a shallow peat cover and here natural regeneration of the native shrub *Sorbus aucuparia* is taking place. Photograph taken in August 2007.



A windrow of conifers with profuse regeneration of *Molinia caerulea* in the eastern half of the site. Photograph taken in August 2007.



An aerial photograph of the Shanvolahan site prior to restoration work taking place. Aerial photograph taken in the year 2000.



A close-up aerial photograph of the Shanvolahan site taken in the year 2004. The site outline is in red. Note that not all of the conifers were felled at this site at the time the photograph was taken.

4. Vegetation of the site

The western half of this site was dominated by an area of tall conifer plantation (Lodgepole pine) planted in 1976. The ground layer of this woodland was dominated by a thick layer of pine needles along with a sparse layer of mosses such as *Hypnum cupressiforme*, *Rhytidiadelphus loreus* and *Sphagnum capillifolium*. Vascular plants were very sparse with only *Molinia caerulea* and the fern *Dryopteris dilatata* occurring frequently.

The remaining afforested portions of the site were planted with a mixture of lodgepole pine and Sitka spruce in 1986. In these areas the relatively young trees has not yet formed a dense canopy and thus blanket bog species such as *Molinia caerulea*, *Calluna vulgaris* and *Potentilla erecta* were still locally abundant at the start of restoration work.

The small open areas which occur throughout the site still retain a relatively intact blanket bog flora. The dominant species are typically *Schoenus nigricans*, *Trichophorum cespitosum*, *Erica tetralix* and *Narthecium ossifragum*. In the numerous pools which occur, aquatic species such as *Sphagnum cuspidatum* and *Menyanthes trifoliata* tend to be dominant. Occasional clumps of *Vaccinium oxycoccus*, which is a rare species in the lowland blanket bogs of western Ireland, grow in wet Sphagnum rafts close to pool areas within the site. Fen vegetation occurs in the north-east of the site and the dominant species is generally *Molinia caerulea* with *Cladium mariscus* and *Myrica gale* also locally abundant. This vegetation supports occasional clumps of the rare moss *Tomenthypnum nitens*.

Table 2. Vegetation at Shanvolahan

Vegetation type	A	A	A	A	A	B	B	B	B	C	C	
Quadrat code	SH9	SH11	SH1	SH10	SH2	SH3	SH4	SH5	SH8	SH6	SH7	
Quadrat size (m ²)	4	4	4	4	4	4	4	4	4	4	4	
Grid letter	G	G	G	G	G	G	G	G	G	G	G	
Fastig	-	06942	06846	06795	06813	06799	06808	06814	06876	06836	06846	
Plotting	-	20077	20440	20268	20463	20568	20597	20672	20379	20699	20688	
Slope (degrees)	0	0	0	0	0	0	0	0	0	0	0	
Vegetation cover (%)	100	100	98	85	100	100	100	100	100	98	100	
Bare rock (%)	0	0	0	0	0	0	0	0	0	0	0	
Bare soil (%)	0	0	2	15	0	0	0	0	0	2	0	
Open water (%)	0	0	0	0	0	0	0	0	0	0	0	
Dwarf shrub cover (%)	75	35	70	50	75	45	15	35	25	15	30	
Herb cover (%)	40	70	8	70	20	85	95	90	95	95	90	
Bryophyte cover (%)	60	90	95	40	90	5	10	3	0	2	0	
Ht. of vegetation (cm)	30-50	10-20	20-40	5-15	10-30	40-60	50-70	40-60	30-40	50-70	30-60	
No. of species	11	13	14	20	18	8	6	7	10	13	11	

<i>Calluna vulgaris</i>	8	4	8	5	8	6	5					
<i>Cladonia</i>	4	8	7	5	5							
<i>Cortetosa</i>												
<i>Carthecium</i>	1		4	5	4						3	
<i>Cassifragum</i>												
<i>Dontoschisma</i>	3	3	3	1								
<i>Phagni</i>												
<i>Phagnum</i>	7	5	8	4	8	4						
<i>Capillifolium</i>												
<i>Phagnum</i>	5	4		4	3							
<i>Capillosum</i>		4		5	3							
<i>Phagnum</i>												
<i>enellum</i>												
<i>Scapania sp.</i>			3		5							
<i>Trichophorum</i>			3	5	4						1	
<i>Respitosum</i>												
<i>Triflorum</i>			4	4	3				1			
<i>Angustifolium</i>												
<i>Racomitrium</i>		4			4							
<i>Canuginosum</i>												
<i>Rosera rotundifolia</i>				1	1							
<i>Cirsium dissectum</i>								4	6	4	3	
<i>Succisa pratensis</i>						1		1		3	1	
<i>Athyranthes</i>										1	4	
<i>Rifoliata</i>												
<i>Cladium mariscus</i>										7	6	
<i>Molinia caerulea</i>	7	8		2		9	9	9	8	3	5	
<i>Lyrice gale</i>	3	4	5	3		5	5	5	5	5	5	
<i>Erica tetralix</i>	4	5	4	5	4				4	4	5	
<i>Cynnum</i>	4	5	5	5	4	3	1	3				
<i>Compressiforme</i>												
<i>Potentilla erecta</i>	1	3				3	3	3	3	1		
<i>Schoenus nigricans</i>				5	4				3	8		
<i>Carex panicea</i>				3					3			
<i>Cladonia uncialis</i>				4	3							
<i>Cylocomium</i>			3				5					
<i>Plendens</i>												
<i>Pedicularis</i>				1	3							
<i>Cylvatica</i>												
<i>Polygala</i>		3										
<i>Cerpyllifolia</i>												
<i>Cylocomium</i>			3									
<i>Calustris</i>												
<i>Melampyrum</i>			1									
<i>Cylvaticum</i>												

<i>Rhynchospora alba</i>	4							
<i>Pleurozia purpurea</i>	1							
<i>Diplophyllum</i>		4						
<i>ilbicans</i>								
<i>Cladonia</i> sp.		1						
<i>Polcus lanatus</i>			3					
<i>Laccinium</i>				1				
<i>Xyccoccus</i>								
<i>Carex echinata</i>						1		
<i>Carex rostrata</i>							3	
<i>Dactylorhiza</i> sp.							1	
<i>Campylium</i>							1	
<i>stellatum</i>								
<i>Stendium</i>							1	
<i>nolluscum</i>								
<i>Carex viridula</i>								3
<i>rachy.</i>								
<i>Carex pulicaris</i>						1		

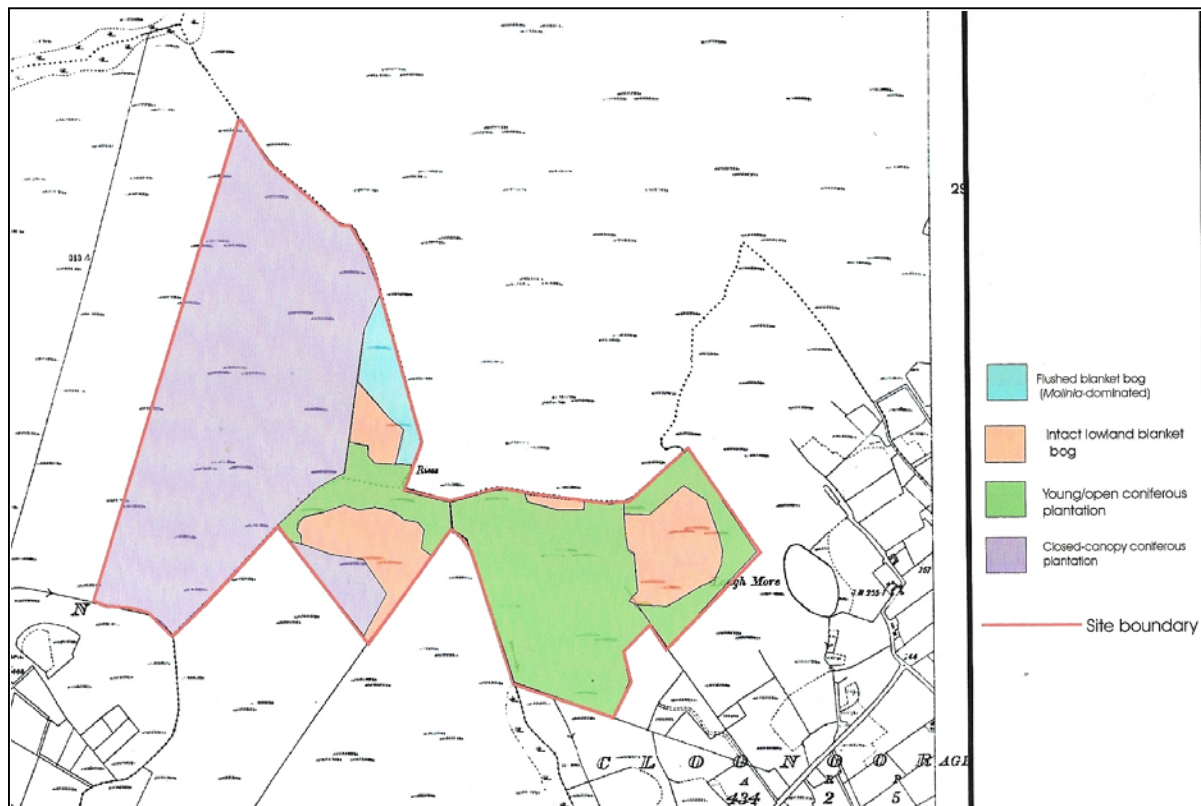
A = Ombrotrophic blanket bog

B = Species-poor *Molinia* fen

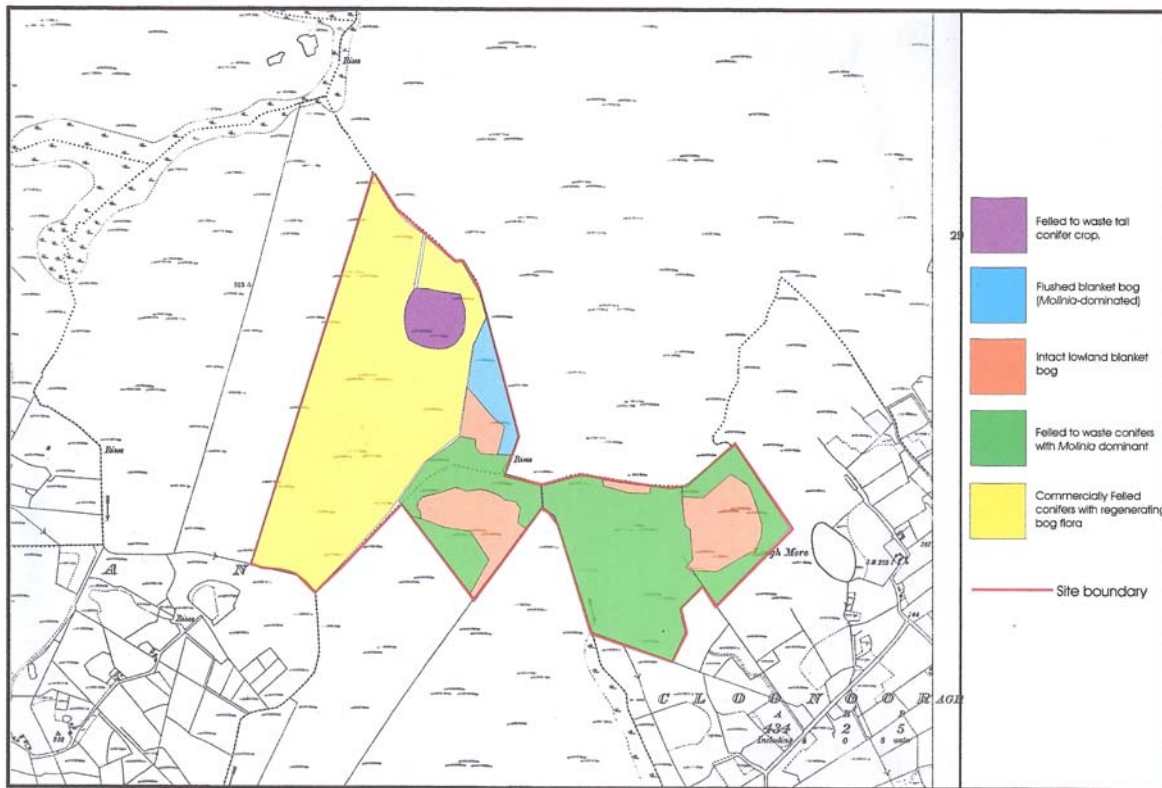
C = *Molinia-Cladium* fen.

5. Changes in overall vegetation/habitat cover

The western half of this site is now dominated by a regenerating blanket bog surface which still contains a high cover of brash and stumps following conifer removal. Regeneration of blanket bog vegetation is slow due to the heavy cover of conifers previously. Much of the remainder of the site is dominated by regenerating, *Molinia*-dominated, blanket bog with frequent wind-rows of felled conifers.



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



Map of present vegetation cover at Shanvolahan

A map of habitat/vegetation cover at Shanvolahan at the end of the restoration 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 4 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

Vegetation recovery at this site is to a large extent dictated by the size/age of the conifer plantation which previously grew. In the area which was dominated by a tall, commercial quality, conifer crop the bog surface is presently dominated by woody brash left behind after commercial conifer harvest and a mixture of plant species, mostly typical of dried-out peatland habitats. The main recolonizing plant growing in this area are *Juncus effusus*, *Molinia caerulea*, *Calluna vulgaris*, *Dryopteris dilatata* and the mosses *Hypnum cupressiforme* and *Campylopus* spp.. In the drier, northern third of the commercially felled area species such as *Epilobium angustifolium* and *Rubus fruticosus* have a high cover, which is presumably due to the drier nature of the peat soil in this area. A low knoll in this part of the site has a thin cover of peat and thus there has been a considerable level of natural regeneration of native shrubs, especially *Sorbus aucuparia*.

In the remaining parts of this site where a crop of relatively young coniferous trees were felled to waste and windrowed, the recovery of *Molinia caerulea* has been spectacular with 75%+ cover of the species in most areas after 3 years. The other more frequent species in this regenerating peatland vegetation are *Calluna vulgaris*, *Erica tetralix*, *Myrica gale*, *Hypnum cupressiforme* and *Sphagnum capillifolium*.



Permanent quadrat 1 – September 2004.



Permanent quadrat 1 – August 2007.

Site - Shanvolahan			
Perm. Quadrat No. - 1			
GPS – G 07063 20193			
Size – 7m x 7m			
Slope – 3 to 5 degrees			
Vegetation Height (cm)	30-40	30-50	30-50
Vegetation cover (%)	75	90	95
Needle litter cover (%)	20	10	0
Brash cover (%)	5	2	3
Bare ground cover (%)	5	0	3
Dwarf shrub cover (%)	20	20	30
Herb cover (%)	45	65	75
Bryophyte cover (%)	50	40	60
No. of plant species	17	17	18
Survey date	8/9/04	2/9/05	1/8/07
<i>Molinia caerulea</i>	5	6	6
<i>Hypnum cupressiforme</i>	5	5	5
<i>Calluna vulgaris</i>	4	4	5
<i>Sphagnum capillifolium</i>	4	4	4
<i>Dicranum scoparium</i>	3	2	1
<i>Cladonia portentosa</i>	3	3	3
<i>Sphagnum papillosum</i>	3	2	3
<i>Erica tetralix</i>	2	2	3
<i>Myrica gale</i>	2	2	3
<i>Polytrichum commune</i>	2	1	2
<i>Hylocomium splendens</i>	2	3	1
<i>Rhytidiadelphus loreus</i>	2	-	-
<i>Pinus contorta</i> seedlings	1 (5 counted)	-	1
<i>Agrostis</i> spp.	1	1	1
<i>Dryopteris dilatata</i>	1	1	-
<i>Pseudoscleropodium purum</i>	1	1	-
<i>Potentilla erecta</i>	1	2	2
<i>Eriophorum angustifolium</i>		2	2
<i>Sphagnum palustre</i>		2	-
<i>Plagiothecium undulatum</i>			1
<i>Lophocolea bidentata</i>			1
<i>Campylopus</i> sp.			1
<p>History – Previously dominated by a mixed Lodgepole pine/Sitka spruce plantation planted in 1986. Trees were generally between 6 and 8 metres tall. Ground vegetation dominated by conifer needles and <i>Molinia caerulea</i>. Trees felled in Spring of 2004 and subsequently windrowed.</p>			



Permanent quadrat 2 – September 2004



Permanent quadrat 2 – August 2007.

Site - Shanvolahan			
Perm. Quadrat No. - 2			
GPS – G 06719 20159			
Size – 7m x 7m			
Slope – 3 to 5 degrees			
Vegetation Height (cm)	<10	10 to 20	20 to 30
Vegetation cover (%)	8	20	70
Needle litter cover (%)	80	70	30
Brash cover (%)	3	3	10
Bare ground cover (%)	10	5	0
Dwarf shrub cover (%)	1	5	15
Herb cover (%)	5	10	40
Bryophyte cover (%)	3	10	50
No. of plant species	13	17	21
Survey date	8/9/04	2/9/05	1/8/07
<i>Hypnum cupressiforme</i>	2	3	4
<i>Molinia caerulea</i>	2	3	4
<i>Sphagnum capillifolium</i>	2	2	4
<i>Calluna vulgaris</i>	1	2	4
<i>Epilobium angustifolium</i>	1	1	2
<i>Dryopteris dilatata</i>	1	2	2
<i>Juncus</i> sp.	1	-	-
<i>Potentilla erecta</i>	1	1	1
<i>Rubus fruticosus</i>	1	1	1
<i>Salix</i> seedlings	1	-	-
<i>Sphagnum palustre</i>	1	2	3
<i>Sphagnum papillosum</i>	1	-	-
<i>Pinus contorta</i> seedlings	1 (8 counted)	1 (2 counted)	1
<i>Erica tetralix</i>		1	1
<i>Eriophorum vaginatum</i>		1	1
<i>Polygala serpyllifolia</i>		1	-
<i>Dicranum scoparium</i>		1	1
<i>Polytrichum commune</i>		1	5
<i>Campylopus introflexus</i>		3	4
<i>Epilobium montanum</i>		1	-
<i>Agrostis</i> sp.			2
<i>Holcus lanatus</i>			1
<i>Luzula multiflora</i>			1
<i>Anthoxanthum odoratum</i>			1
<i>Hypchoeris radicata</i>			1
<i>Carex echinata</i>			1
History – Previously dominated by a mixed Lodgepole pine plantation planted in 1986. Trees were generally between 6 and 8 metres tall. Ground vegetation dominated by conifer needles. Trees felled in Spring of 2004 and subsequently windrowed.			



Permanent quadrat 3 – September 2005.



Permanent quadrat 3 – July 2007.

Site - Shanvolahan			
Perm. Quadrat No. - 3			
GPS – G 06475 20679			
Size – 6m x 6m			
Slope – 0 degrees			
Vegetation Height (cm)	<3	<5	15 to 20
Vegetation cover (%)	20	50	60
Needle litter cover (%)	50	30	30
Brash cover (%)	20	10	5
Bare ground cover (%)	10	10	5
Dwarf shrub cover (%)	5	20	30
Herb cover (%)	10	25	20
Bryophyte cover (%)	20	30	50
No. of plant species	16	20	22
Survey date	2/9/05	13/9/06	1/8/2007
<i>Campylopus</i> sp.	3	4	4
<i>Dryopteris dilatata</i>	3	4	5
<i>Hypnum cupressiforme</i>	3	3	4
<i>Calluna vulgaris</i>	2	4	4
<i>Dicranum scoparium</i>	2	1	-
<i>Hylocomium splendens</i>	2	-	-
<i>Rubus fruticosus</i>	2	1	1
<i>Sphagnum palustre</i>	2	4	4
<i>Sphagnum cuspidatum</i>	2	2	3
<i>Epilobium angustifolium</i>	1	2	1
<i>Eriophorum angustifolium</i>	1	2	3
<i>Molinia caerulea</i>	1	2	2
<i>Potentilla erecta</i>	1	-	1
Liverwort sp.	1	-	-
<i>Sphagnum capillifolium</i>	1	3	3
<i>Pinus contorta</i> seedlings	1 (3 counted)	-	-
<i>Polytrichum commune</i>		3	4
<i>Juncus bulbosus</i>		1	2
<i>Thuidium tamariscinum</i>		2	1
<i>Erica tetralix</i>		1	1
<i>Carex panicea</i>		1	-
<i>Eriophorum vaginatum</i>		1	2
<i>Plagiothecium undulatum</i>		1	1
<i>Rhytidiadelphus loreus</i>		1	-
<i>Juncus effusus</i>			1
<i>Luzula multiflora</i>			1
<i>Cladonia</i> sp.			1
<i>Leucobryum glaucum</i>			1
History – Previously dominated by a Lodgepole pine plantation planted in 1976. Trees were generally between 8 and 10 metres tall. Ground vegetation dominated by conifer needles. Trees felled in Spring of 2005 and removed for sale.			



Permanent quadrat 4 – September 2005.



Permanent quadrat 4 – September 2006.

Site - Shanvolahan			
Perm. Quadrat No. - 4			
GPS – G 06588 20859			
Size – 6m x 6m			
Slope – 0 degrees			
Vegetation Height (cm)	30 to 40	30 to 40	30 to 40
Vegetation cover (%)	50	75	80
Needle litter cover (%)	40	10	5
Brash cover (%)	30	25	15
Bare ground cover (%)	10	5	5
Dwarf shrub cover (%)	10	20	35
Herb cover (%)	35	40	50
Bryophyte cover (%)	20	40	60
No. of plant species	15	19	18
Survey date	2/9/05	13/9/06	1/8/07
<i>Dryopteris dilatata</i>	4	5	4
<i>Hypnum cupressiforme</i>	4	4	5
<i>Epilobium angustifolium</i>	4	4	4
<i>Rubus fruticosus</i>	4	4	4
<i>Calluna vulgaris</i>	2	2	4
<i>Dicranum scoparium</i>	2	3	2
<i>Polytrichum commune</i>	2	3	4
<i>Rumex acetosella</i>	2	1	2
<i>Luzula multiflora</i>	2	2	3
<i>Stellaria uliginosa</i>	1	1	-
<i>Plagiothecium undulatum</i>	1	1	-
<i>Molinia caerulea</i>	1	1	1
<i>Potentilla erecta</i>	1	-	-
<i>Rhytidiadelphus squarrosus</i>	1	1	-
<i>Pinus contorta</i> seedlings	1 (1 counted)	-	-
<i>Thuidium tamariscinum</i>		3	2
<i>Campylopus</i> sp.		3	4
<i>Eurhynchium praelongum</i>		2	2
<i>Hypochoeris radicata</i>		1	1
<i>Dryopteris filix-mas</i>		1	-
<i>Eriophorum angustifolium</i>		1	2
<i>Erica tetralix</i>			1
<i>Anthoxanthum odoratum</i>			1
<i>Sorbus aucuparia</i> saplings			1
History – Previously dominated by a Lodgepole pine plantation planted in 1976. Trees were generally between 8 and 10 metres tall. Ground vegetation dominated by conifer needles. Trees felled in Spring of 2005 and removed for sale.			

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