Cloonfelliv Bog (SAC 002110), Co. Galway/Roscommon

Executive Summary

This survey, carried out in February 2013, aimed to assess the conservation status of habitats listed on Annex I of the European Habitats Directive (92/43EEC) on the high bog at Cloonfelliv Bog. Vegetation was described and mapped based on raised bog ecotope vegetation community complexes (Kelly and Schouten, 2002). The following Annex I habitats occur: Active Raised Bog, Degraded Raised Bog and Depressions on peat substrates of the Rhynchosporion.

Active Raised Bog covers 0.66 ha (1.20%) of the high bog area. Central ecotope is absent from the site, although a small area of sub-central ecotope (**Sc1**) towards the north of the high bog resembles central ecotope to some degree. However, it essentially a large pool (ca. 15m x 7m) full of *Sphagnum cuspidatum* with lawns and low hummocks of other *Sphagna* such as *S. papillosum*, *S. palustre* and *S. capillifolium* growing in, but mostly at the edge of, the pool. The *Sphagnum* cover approaches 100% and *Eriophorum angustifolium* is the most dominant vascular plant. A small area of active flush (flush **B**) is present towards the south of the high bog. This flush, which is only partially mapped as active is dominated by *Calluna vulgaris, Eriophorum vaginatum* and hummocks of *Sphagnum capillifolium* with *S. fallax* also recorded. The only other Active Raised Bog mapped on the site is found close to the centre of the high bog (**Sc2**) where there is a small area of poor quality sub-central ecotope with Sphagnum cover of 34-50% composed mostly of hummocks of *Sphagnum capillifolium* and *S. papillosum* with a patchy cover of *S. cuspidatum* in the pools.

Degraded Raised Bog covers 54.41ha (98.80%) of the high bog area. It is drier than Active Raised Bog and supports a lower density of *Sphagnum* mosses. It has a less developed micro-topography while permanent pools and *Sphagnum* lawns are generally absent. The habitat also includes some inactive flushes.

Depressions on peat substrates of the Rhynchosporion are found in both Active and Degraded Raised Bog, but tend to be best developed and most stable in the wettest areas of Active Raised Bog. Only *Rhynchospora alba* was recorded on Cloonfelliv Bog.

No restoration works have taken place at the site.

The current conservation objective for Cloonfelliv Bog is to restore the area of Active Raised Bog to the area present when the Habitats Directive came into force in 1994. In the case of Active Raised Bog, the objective also includes the restoration of all of the sub-marginal ecotope present at the time as this represents the area of Degraded Raised Bog most technically feasible to restore. The Area objective for Active Raised Bog is 31.58ha. The objective in relation to Structure and Functions (S&Fs) is that at least half of the Active Raised Bog area should be made up of the central ecotope and active flush (i.e. the wetter vegetation communities). These values have been set as Favourable Reference Values or FRVs until more site specific values can be set based on hydrological and topographical studies. The objective for Degraded Raised Bog is for the sub-marginal area to be restored to active peat forming communities as stated above and that no loss or degradation of any kind occurs. Although FRVs could not be established for the Rhynchosporion depressions, the objectives are to increase its extent and to improve its quality to values associated with a favourable conservation status of Active Raised Bog. Therefore, the habitat's objectives are indirectly associated with Active Raised Bog objectives.

There has been no change in the area of Active Raised Bog (0.66ha) at Cloonfelliv Bog in the 2004 to 2013 period, but there have been some minor changes to the boundaries of the habitat. However, all such changes are attributed to the more comprehensive mapping exercise employed in the current survey or to vegetation re-interpretation.

Peat cutting and drainage of the high bog are the most threatening current activities at the site. 0.14ha of high bog have been lost in the reporting period due to peat cutting. 0.97km of drains remain functional or reduced functional. Cutover drainage (peripheral drainage) also continues to impact on the high bog habitat and maintenance works have been carried out in the reporting period on cutover drains in agricultural land to the south-east of the high bog. No fire events have affected the bog in the reporting period and most of the high bog has apparently remained unburned for over 30 years.

Active Raised Bog has been given an overall Unfavourable Bad–Declining conservation status assessment. Habitat Area and quality (S&Fs) have remained unchanged in the reporting period. However, both Area and S&Fs values are below favourable reference values. Future Prospects are considered Unfavourable Bad-Declining as impacting activities (peat cutting and drainage) continue to threaten the habitat.

Degraded Raised Bog has been given an overall **Unfavourable Bad-Declining** conservation assessment and **Rhynchosporion depressions** has been given an **Unfavourable Bad-Declining** conservation status assessment.

The overall raised bog at Cloonfelliv SAC has been given an Unfavourable Bad-Declining assessment.

A series of **recommendations** have been also given, these include: cessation of peat cutting; restoration works on the high bog and the cutover including the blocking of functional and reduced functional drains; further hydrological and topographical studies to ascertain more accurate FRVs; and further botanical monitoring surveys.

Site identification

SAC Site Code	002110	6" Sheet:	RN 26/33, GY12
Grid Reference:	E 165130 / N 274200	1:50,000 Sheet:	39
High Bog area (ha):	55.07ha 1		
Dates of Visit:	07/02/13		
Townlands:	Cloonfelliv		

¹ The current extent of the high bog is 55.07ha, while that reported in 2004 was 54.60ha (Fernandez *et al.*, 2005). This discrepancy is the result of more accurate mapping of the high bog edge by using the higher resolution 2010 aerial images compared to those used in 2004, rather than any actual increase in high bog extent. High bog area has in fact decreased in the 2004-2012 period due to peat cutting. The actual high bog extent in 2004 was 55.21ha (see tables 8.1 and 8.3 2004 (amended) figures).

Site location

Cloonfelliv Bog is situated 5 km north-east of Ballymoe, west Co. Roscommon on the border with north-east Co. Galway. It neighbours Moorfield Bog/Farm Cottage (NHA 221) that lies to the west and is adjacent to Corliskea and Trien Bogs that lie to the east and north-east respectively. Corliskea and Trien together with Cloonfelliv form one SAC (SAC 2110). These bogs are separated by several streams/rivers, cutover bog, grassland and some roads. Access to Cloonfelliv is easiest from the north by a bog road that can be reached by taking the second left off the N60 to the north of Ballymoe.

Description of the survey

The survey was carried out in February 2013 and involved a vegetation survey of the high bog at Cloonfelliv Bog and the recording of impacting activities affecting high bog vegetation. A similar survey was carried out in 2004 by Fernandez *et al.* (2005). High bog vegetation was described and mapped, based on raised bog ecotope vegetation community complexes developed by Kelly and Schouten (2002). Detailed notes were taken on each community complex and any flushed areas that were present. These included: species lists; estimation of % cover of dominant species; percentage

Sphagnum cover; evidence of damage (due to burning, peat cutting or drainage); micro-topography; ground firmness; and presence of *Cladonia* species. A list of photographical records is given in Appendix II. The survey aimed to assess the conservation status of Habitats Directive (Council Directive 92/43/EEC) Annex I habitats on the high bog.

The entire high bog of Cloonfelliv Bog was re-surveyed. Sections mapped as sub-marginal, subcentral and central ecotope in 2004 were surveyed in more detail. These are the areas where changes were likely to have occurred. Quadrats, which describe the micro-topographical features and indicator species, recorded in the 2004 project (Fernandez *et al.* 2005) were re-surveyed and additional quadrats were recorded where necessary (see Appendix III). The size of quadrats was 4m x 4m for Active Raised Bog.

A GeoExplorer handheld GPS minicomputer (Trimble GeoXT) was used in the field to record quadrats, ecotope boundaries, location of vegetation complexes and other points of interest. The GPS positions of these features were logged and stored on Terrasync software (Trimble). Additional comments were stored as text fields in the device. Post processing of data was carried out, based on the Active GPS Network from Ordnance Survey Ireland, to obtain sub-metre accuracy of the data.

A digital vector format ecotope vegetation map was produced based on the spatial data collected during the survey using ArcGIS 9.3 and 2010 aerial photography. The Irish National Grid was used as the co-ordinate reference system. Vegetation complex and ecotope maps are given in Appendix IV.

Description of the high bog

This bog has been classified as a small Western/Intermediate type Raised Bog (Cross 1990). The bog is also likely to be classed geomorphologically as a Ridge Basin bog, though it was not surveyed by Kelly *et al.*, (1995). It has a regular ovoid shape tapering at the south end. The high bog reaches maximum height at the *Calluna* ridge in the mid-south. The bog gradually slopes upwards from the north to the south up to this point. The bog slopes out to the margins on all sides. There are two obvious high areas, one is a *Calluna* mound in the north and the other is the *Calluna* ridge at the highest point of the bog in the south.

Ecological Information

Raised Bog Annex I (Habitats Directive (92/43/EEC)) habitats

The following Raised Bog EU Annex I habitats, are found in Cloonfelliv Bog:

- Active Raised Bog (EU code 7110),
- Degraded Raised Bog (EU code 7120),
- Depressions on peat substrates of the Rhynchosporion (EU code 7150).

Active Raised Bog (7110)

The current area of Active Raised Bog at Cloonfelliv Bog is 0.66ha (1.20% of the high bog). This is unchanged from 2004. The bog was not surveyed in 1994.

Active Raised Bog includes sub-central ecotope and active flush.

Sub-central ecotope was found at two locations (**Sc1** & **Sc2**) (see Appendix IV, Map 1). Only two community complex types were recorded. Complex 9A/10 in Sc1 towards the north of the high bog is essentially a large pool (ca. 15m x 7m) full of *Sphagnum cuspidatum* with lawns and low hummocks of other *Sphagna* such as *S. papillosum*, *S. palustre* and *S. capillifolium* growing in, but mostly at the edge of, the pool. The *Sphagnum* cover approaches 100% and *Eriophorum angustifolium* is the most dominant vascular plant. Complex 9/7 + P in **Sc2** towards the centre of the high bog is a much poorer quality area of sub-central ecotope. The *Sphagnum* cover here ranges from 34-50% and is composed mostly of hummocks of *Sphagnum capillifolium* and *S. papillosum* with a patchy cover of *S. cuspidatum* in the pools. *Calluna vulgaris* and *Eriophorum vaginatum* are the most dominant vascular plants while evidence of flushing is also indicated by the presence of *Aulacomnium palustre* and *Polytrichum strictum*.

A small partially active flush (**B**) is present towards the south of the high bog. Hummocks of *Sphagnum capillifolium* dominate the *Sphagnum* layer although *S. fallax* is also present. Robust *Calluna vulgaris* dominates the vegetation with *Molinia caerulea, Phragmites australis, Vaccinium oxycoccos, Eriophorum angustifolium, E. vaginatum, Polytrichum strictum, Hylocomium splendens* and *Pleurozium schreberi* also recorded.

Degraded Raised Bog (7120)

The current area of Degraded Raised Bog at Cloonfelliv Bog is 54.41ha (98.80% of the high bog).

Degraded Raised Bog includes the sub-marginal, marginal and face bank ecotope, as well as inactive flushes. Although some areas of Degraded Raised Bog have a relatively well-developed Raised Bog flora, they are affected by water loss to varying degrees, and are usually devoid of permanent pools.

The sub-marginal ecotope features the most developed micro-topography within Degraded Raised Bog. Although pools are mostly absent from the high bog, they are found within the wettest submarginal ecotope community complex (9/7/3+P). However, these pools generally feature a low Sphagnum cover and are mostly covered with algae. The Sphagnum cover in these pools is usually approximately 26-33% composed mostly of hummocks of Sphagnum capillifolium and S. papillosum with a sometimes patchy cover of S. cuspidatum and S. denticulatum in the pools. Calluna vulgaris, Eriophorum vaginatum and Carex panicea are the most dominant vascular plants with Eriophorum angustifolium also frequent in places. The western indicator species Racomitrium lanuginosum and *Campylopus atrovirens* are also present. The cover of *Cladonia portentosa* can be high on hummocks and appears to have displaced the *Sphagnum* in places. Pools are also present in the slightly poorer quality sub-marginal complex 6/3 +P. However, much of the pools in this complex have a very poor cover of S. cuspidatum in the pools and there is also a higher cover of Narthecium ossifragum and Carex panicea. Complex 9/7 + Cl characterises much of the sub-marginal ecotope in the southern part half of the high bog. This complex is devoid of pools and *Calluna vulgaris* and *Eriophorum vaginatum* are the most dominant vascular plants. There is also a very high (sometimes >50%) cover of *Cladonia* portentosa. The poorer quality sub-marginal complex is complex 6/3/9 and this has Sphagnum cover of 11-25% composed mostly of hummocks of Sphagnum capillifolium and S. papillosum. Calluna vulgaris, Narthecium ossifragum, Carex panicea and Eriophorum vaginatum are the most dominant vascular plants.

Marginal ecotope is slightly drier than sub-marginal ecotope and mainly occurs as a narrow band near the margins of the high bog. The micro-topography consists of *Calluna vulgaris* hummocks, low *Sphagnum* hummocks, flats and very occasionally hollows and tear pools. The *Sphagnum* cover is even lower here than in the sub-marginal ecotope (<10%) and the vegetation is characterised by a higher cover of *Carex panicea*, *Narthecium ossifragum*, *Trichophorum germanicum*, and *Calluna vulgaris*. Complex 3/6 dominates the marginal ecotope at Cloonfelliv Bog. A small area of marginal ecotope in the north-east of the site supports some pools (with little or no *Sphagnum*) and the complex here is termed 3/6 +P.

Face bank ecotope is characterised by firm ground, tall *Calluna vulgaris*, poor *Sphagnum* cover and a flat micro-topography. This occurs in some parts of Cloonfelliv Bog as an extremely narrow band at the high bog edge.

The high bog also features several inactive flushes (**A**, **C** and **D**). Flush **A** is dominated by Molinia caerulea with a *Sphagnum* cover of 4-10%. Flush **C** is dominated by *Molinia caerulea, Calluna vulgaris* and *Eriophorum vaginatum* with a *Sphagnum* cover of 26-33%; parts of this flush may in fact be old cutover bog. Flush **D** is dominated by *Calluna vulgaris* with a *Sphagnum* cover of 11-25%.

Depressions on peat substrates of the Rhynchosporion (7150)

Rhynchosporion vegetation is widespread on Cloonfelliv Bog. It is found in both Active and Degraded Raised Bog, but tends to be best developed and most stable in the wettest areas of Active Raised Bog. In these areas, the Rhynchosporion vegetation occurs within *Sphagnum* hollows and along *Sphagnum* pool edges and on lawns. However, neither pools nor lawns are very common at this site. It was most frequent in the sub-central complex 9/7 +P and the sub-marginal complex 6/3 + P. Typical plant species include *Rhynchospora alba, Sphagnum cuspidatum, S. magellanicum, S. papillosum, Drosera anglica* and *Eriophorum angustifolium*.

R. alba was also found within Degraded Raised Bog, but always associated with wet features such as hollows and run off channels.

Detailed vegetation description of the high bog

A detailed description of high bog vegetation recorded during the 2013 survey of Cloonfelliv Bog is given in Appendix I. Vegetation is divided into a number of community complexes, which are listed and described based on the dominant species. These community complexes are grouped into ecotope types. The distribution of the ecotopes is shown on the ecotope map (Appendix IV, Map 1). The community complexes are shown on the community complex map (Appendix IV, Map 2) and the quadrat details are given in Appendix III and their location in Appendix IV (Map 1).

Impacting activities

Table 6.1 below provides a list of activities impacting high bog vegetation at Cloonfelliv Bog, according to their occurrence on the high bog or adjacent to the high bog; area or length affected, and whether they influence negatively (i.e. drainage, peat extraction) or positively (i.e. restoration works):

	Table 6.1 Impacting activities									
Code	Activity	Ranking	Influence	Area (ha) /Length(km)	Location	Habitat affected				
C01.03	Peat extraction	Н	-1	0.14haof the	Inside High Bog: 3	7120				

				high bog cut away	different locations on the high bog (2 in the north and 1 in the south-east) Outside High Bog: 1 plot on the northern cutover	
C01.03	Peat extraction	L	-1	0.14haof the high bog cut away	Inside High Bog: 3 different locations on the high bog (2 in the north and 1 in the south-east) Outside High Bog: 1 plot on the northern cutover	7110/7150
J02.07	Drainage	М	-1	0.968km ¹	Inside High Bog	7110/7120/7150
J02.07	Drainage	М	-1	n/av	Outside High Bog	7110/7120/7150
I01	Invasive alien species	L	-1	<0.1ha ³	Inside High Bog	7120

HB: High Bog; Ranking: H: High importance/impact; M: Medium importance/impact; L: Low importance/impact.

¹ This figure only includes functional and reduced-functional drains.

² This figure includes blocked drains on high bog.

³ This figure is estimated and represents the extent of trees across entire high bog

n/a: not applicable, n/av: not available

Peat cutting

This activity has taken place at 4 locations in Cloonfelliv Bog in the 2004/5-2010 period; 2 locations (plots) along the north and one in the south-east of the high bog as well as an additional plot on the northern cutover (E165267/N274704). This has reduced the area of high bog by 0.14ha. The loss of high bog from peat cutting is calculated using aerial photography. As aerial photography is not available post 2010, it cannot be ruled out that cutting may have taken place in additional locations in the 2011-2013 period. Further high bog may therefore have been lost and the figure quoted should be considered a minimum value.

This activity is considered to have a high importance/impact on Degraded Raised Bog habitat and low on Active Raised Bog and Rhynchosporion depressions. The continuation of these peat cutting will prevent the recovery of the high bog, and the recovery of ARB towards FRVs as restoration works cannot be employed until such activities stop. It should also be borne in mind that peat cutting has already had a serious negative impact over a long period at this site, indicated by the fact that ARB covers only a very small area (0.66ha or 1.2.0% of the high bog) and is 97.917% below the FRV target. In addition, old face banks and high bog and cutover drainage associated with cutting continue to cause negative impacts on the high bog habitats.

Drainage

High bog drainage

Table 6.2 shows that 0.29km of high bog drains (namely, drain **d1**) have partially infilled during the reporting period and are now classed as reduced functional having been classed as functional in 2004. Only 0.332km (drain **d8** and part of **d3**) of high bog drains are functional on Cloonfelliv Bog with a further 0.636km (**d1**, **d2** and **d7**) classed as reduced functional. A significant flow of water was recorded during the 2013 survey in drain **d8**, which runs along the high bog perimeter in the mid-west of the high bog and a slow trickle of water was recorded in drain, **d3**, close to where it meets the high bog edge in the mid-east of the high bog. Reduced functional drains are also still impacting on high bog habitats and will continue to do so until they are blocked and become completely in-filled and thus non-functional.

High bog drainage is considered to have medium importance/impact on high bog habitats.

No blockage of drains has occurred to date.

Table 6.2 High bog drainage summary									
Status	2004 (km) ¹	2013 (km)	Change						
NB: functional	0.622	0.332	(-)0.290						
NB: reduced functional	0.346	0.636	(+)0.290						
NB: non- functional	0.917	0.917	0.000						
B: functional	0.000	0.000	0.000						
B: reduced functional	0.000	0.000	0.000						
B: non- functional	0.000	0.000	0.000						

B: Blocked; NB: Not blocked n/a: not applicable

¹ High bog drainage has been revised (e.g. re-digitised in cases) and figures above may vary slightly from those given by Fernandez *et al.* (2005)

Table 6.3 below provides a more detail description of the drainage present on the high bog at Cloonfelliv Bog including any change in their functionality in the 2004 – 2013 reporting period (see Map 3).

	Table 6.3 High bog drainage detail									
Drain Name	Length (km)	2004 status	2013 status	Change	Comment					
d1	0.290	NB: functional	NB: reduced functional	Yes						
d2	0.280	NB: reduced functional	NB: reduced functional	No	This drain was wrongly classified as non- functional in 2004					

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d3	0.101	NB: functional	NB: functional	No	This section of drain was wrongly classified as non-functional in 2004
d3	0.727	NB: non- functional	NB: non- functional	No	
d4	0.065	NB: non- functional	NB: non- functional	No	
d5	0.030	NB: non- functional	NB: non- functional	No	
d6	0.095	NB: non- functional	NB: non- functional	No	
d7	0.066	NB: reduced functional	NB: reduced functional	No	This drain was wrongly classified as non- functional in 2004
d8	0.231	NB: functional	NB: functional	No	Drain already present in 2004 but not mapped. A fast flow of water heading SSE was recorded in this drain during the 2013 survey.

Bog margin drainage

The cutover areas were not surveyed for drains during 2013.

Drains associated with either currently active or no longer active peat cutting are present along most of the cutover. These drains continue to drain the high bog and impacting on high bog habitats. There are also a number of drains on the northern cutover (where peat cutting is taking place on the cutover) that have been actively maintained during the reporting period.

Drainage maintenance is evident on the 2010 aerial photograph along the south-east of the high bog, adjacent to flush FC (E165414/N273684 250m drain – a fast flow of water heading south-east was recorded in this drain during the 2013 survey) and in the east (E165583/N274070 300m drain), associated with agriculture improvements.

The stream separating Cloonfelliv Bog from Moorfield Bog in the west is also likely to be regularly dredged, the impact of which on the hydrology of Cloonfelliv Bog is unknown. However, it is also unknown whether such drainage works were carried out during the reporting period.

Bog margin drainage is considered to have a medium importance/impact on high bog habitats.

Fire history

No fire events have occurred on the high bog in the 2004-2013 reporting period. Furthermore, Fernandez *et al.* (2005) noted that no fire events had occurred from 1995-2004, but that Douglas and Grogan (1986) noted that much of the western section of the high bog had been burnt in 1979/80.

Invasive species

Campylopus introflexus was recorded only very occasionally during the 2013 (or the 2004) high bog survey of Cloonfelliv Bog, being noted as being particularly frequent along the drain running close to Flush C in the south-east of the site in 2013 and being noted in the facebank complex and in sub-marginal areas in the northern section of the high bog in 2004.

Invasive species are considered to have low importance/impact on Degraded Raised Bog habitat.

Afforestation and forestry management

There are no forestry plantations on the high bog or on the cutover in Cloonfelliv Bog.

Other impacting activities

No other significant impacting activities were noted or recorded in 2013 impacting high bog habitats in the 2005-2013 reporting period.

Conservation activities

Although no physical management actions such as the blocking of drains have yet been carried out to improve the conservation status of the high bog habitats, the NPWS has engaged in negotiation with landowners in relation to the cessation of peat cutting at the site. This has contributed to the reduction in peat cutting. However, despite negotiations, peat cutting has continued.

Conservation status assessment

The assessment of the conservation status of Annex I Active and Degraded Raised Bog and Bog Woodland is based on the following(a more detailed description of conservation status assessment methods is given within the methods section of the project's Summary Report (Volume 1):

AREA - comparison of current habitat area with favourable reference values and its change in the reporting period to assess trends.

STRUCTURE & FUNCTION - comparison of central ecotope and active flush area (i.e. the higher quality wetter vegetation communities) for Active Raised Bog, and marginal and face bank ecotope area (i.e. the lower quality and drier vegetation communities) for Degraded Raised Bog against favourable reference values to assess their status and changes in their area in the reporting period to assess their trend. Community complex descriptions were also taken into account to evaluate changes in ecotope quality together with an analysis of the indicators recorded in the quadrats.

FUTURE PROSPECTS - an assessment of the influence of current and future activities both negative and positive (e.g. restoration works) affecting these habitats. Future Prospects for Active and Degraded Raised Bog are assessed at status and trend level based on the prospects for the habitat to reach favourable reference values in a two reporting period (12 years).

Active Raised Bog (7110)

Area

Table 8.1 indicates that there has been no change in the area of Active Raised Bog at Cloonfelliv Bog from 2004 to 2013. However, there have been some very minor changes to the boundary of the habitat brought about mostly by the increased mapping effort of the 2013 survey, but also partly because of vegetation interpretation differences between the two surveys.

The largest difference is in the south of the high bog where part of flush **B** is now considered to be active. However, the 2004 description already described the flush as having a "relatively high quality *Sphagnum* cover (40% in patches) dominated by *S. papillosum* and *S. capillifolium* along the southern margin" with the vascular plants "dominated by slightly flushed *Calluna vulgaris* and *Eriophorum vaginatum* between the patches of *Molina caerulea*". This description closely resembles the description of the part of this flush that was mapped as active in 2013 and thus the mapping difference is attributed to vegetation interpretation differences between the two surveys.

The boundary of **Sc1** is extremely similar to that mapped in 2004 and any change in the boundary here is attributed to the increased mapping effort of 2013.

The boundary of **Sc2** is also very similar to before, although there is one sub-central point that was taken in 2004 that now lies outside of the area of sub-central. However, this point was taken very close to the infilled drain, **d3**, and it is likely that it was taken due to the presence of a pool of *Sphagnum cuspidatum* occurring in and around the infilled drain. Any area such as this was considered separate to the area of sub-central in 2013. In any case **Sc2** was considered to be an area of borderline sub-central/sub-marginal vegetation by both surveys. Thus any difference in the

boundary of **Sc2** is attributed to the increased mapping effort of 2013 and to vegetation interpretation differences between the two surveys.

The favourable reference value (FRV) for Area is considered to be the sum of Active Raised Bog (central, sub-central ecotopes and active flush) plus sub-marginal ecotope when the Habitats Directive came into force in 1994 (see table 8.4). Therefore, Active Raised Bog Area FRV is 31.58ha (based on 2004 figures by Fernandez *et al.* (2005) since the bog was not surveyed by Kelly *et al.* (1995) in 1994, see tables 8.1 and 8.3 below). This FRV is only approximate until further hydrological and topographical studies are carried out in order to assess the maximum potential capacity of the high bog to support Active Raised Bog. The current habitat area value (0.66ha) is 97.91% below the FRV. A current Area value more than 15% below FRV falls into the **Unfavourable Bad** assessment category.

No long term (1994/5-2013) trend is available for this site as it was not surveyed in 1994, but a short term trend indicates that the Area of Active Raised Bog has remained **Stable** (see table 8.1

The Area of Active Raised Bog at Cloonfelliv Bog is assessed as Unfavourable Bad-Stable (see table 8.5).

Structure & Functions

The FRV for S&Fs is for at least half of the Active Raised Bog area to be made up of central and active flush, i.e. the higher quality wetter vegetation communities. This value is 0.33ha (half of 0.66ha, the current area of Active Raised Bog). The current value is 0.14ha which is 57.58% below the FRV. As a value falling over 25% below the FRV falls into the Unfavourable-Bad assessment category, S&Fs are given an **Unfavourable-Bad** assessment.

No central ecotope is present at Cloonfelliv Bog and table 8.1 indicates no change in the area of active flush. As noted above under "Area" the fact that part of Flush **B** is now mapped as active flush is attributed to vegetation interpretation differences between the two surveys rather than a real difference on the ground.

No long term (1994/5-2013) trend in the area of central ecotope and active flush at the site is available (see table 8.1), but a more recent and short term trend analysis (9 years; 2004-2013) indicates that their areas have remained **Stable**.

Quadrats analysis (**Qsc1**,) indicates the following (only one quadrat was taken in 2004; a further one; **Qsc2** was taken in 2013):

Qsc1: There was only very slight variation in the quadrat data compared to 2004: the cover of pools (4-10%) and the overall *Sphagnum* cover (34-50%) have remained the same. However, the covers of *S. cuspidatum* (<4% in 2004 to 4-10% in 2013) and *S. denticulatum* (absent to <4%) have increased slightly while there has been a slight decrease in the cover of *S. austinii* (<4% to "absent"). The cover of *S. papillosum* (4-10%) and *S. capillifolium* (11-25%) have remained the same. An increase in the cover of *Calluna vulgaris* (4-10% to 26-33%) and *Cladonia portentosa* (26-33% to 34-50%) was also recorded as well as a decrease in the cover of *Narthecium ossifragum* (<4% to absent). However, these changes may merely be the result of a discrepancy in the quadrat location (up to 2m) between both year surveys, rather than an actual change.

Typical good quality indicators and typical plant species are still found in sub-central and active flush throughout the entire bog.

The Structure & Functions of Active Raised Bog at Cloonfelliv Bog are assessed as Unfavourable **Bad-Stable** (see table 8.5).

Future Prospects

Habitat Area has remained unchanged and S&Fs are assessed as stable in the current reporting period. However, there is still 0.968km of functional and reduced functional drains on the high bog with many more on the cutover. 4 turf plots were cut from 2004/5 to 2010. The high bog has been cutaway extensively and the current ARB area represents a particularly small percentage of the total high bog area. There has been no restoration measures carried out at the site which could override the negative influence of impacting activities.

Habitat **Area** is currently 97.91% below FRV (see table 8.4) and a Decreasing trend is foreseen due to the overriding influence of negatively impacting activities. The habitat Area is expected to be more than 15% below FRV in the following two reporting periods (12 years). Thus, habitat's **Area Future Prospects** are assessed as **Unfavourable Bad-Decreasing**. Habitat's **S&Fs** are currently 57.58% below FRV (see table 8.4) and a Declining trend is also foreseen. Therefore S&Fs are expected to be more than 25% below FRV in the following two reporting periods. **S&Fs Future Prospects** are assessed as **Unfavourable Bad-Declining**. **The overall habitat's Future Prospects are Unfavourable Bad-Declining** (see table 8.5).

There is some potential for the restoration of cutover around the entire site, but particularly in the north-west of the site. In addition, the blocking of functional and reduced-functional drains both on the high bog and cutover and the cessation of peat cutting is necessary.

The overall conservation status of Active Raised Bog at Cloonfelliv Bog is assessed as **Unfavourable Bad-Declining** (see table 8.5).

Table 8.1 Changes in Active Raised Bog area										
Active Ecotopes	1994/5 ¹	2004	2004 (amended)	2013	Change (20	04-2013)				
_	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	%				
Sub-central	na	0.60	0.52	0.52	0.00	0.00				
Active flush	na	0.00	0.14	0.14	0.00	0.00				
Total	na	0.60	0.66	0.66	0.00	0.00				

¹These are the figures calculated from the vegetation map drawn by Kelly *et al.*, (1995) that was geo-referenced, digitised and in some cases adjusted as part of Fernandez *et al.* (2005) project.

Note: Table 8.1 includes 2004 figures and 2004 amended figures. The latter shows the ecotope area believed to be present in 2004 after surveying improvements in 2013. The comparison between 2004 (amended) and 2013 illustrates the actual changes in ecotope area in the 2004-2013 period. Any change in ecotope area between the 2004 and the 2004 (amended) values is due to improvement in mapping accuracy and/or the result of a more comprehensive survey in 2013 (see table 8.2 for further detail).

Area	Quadrats	Trend	Comment	Quadrats analysis
Sc1	Qsc2	Stable	Slight changes in boundary (smaller). This change is the result of more comprehensive surveying in 2013 which resulted in more accurate mapping.	Newly recorded quadrat.
Sc2	Qsc1	Stable	Slight changes in boundary (smaller). This change is the result of more comprehensive surveying in 2013 which resulted in more accurate mapping.	A very slight variation in the quadrat data compared to 2004: the cover of pools (4-10%) and the overall <i>Sphagnum</i> cover (34-50%) have remained the same. However, the covers of <i>S. cuspidatum</i> (<4% to 4-10%) and <i>S. denticulatum</i> (absent to <4%) have increased slightly while that of <i>S. austinii</i> (<4% to absent) has decreased. However, these changes may merely be the result of a discrepancy in the quadrat location (up to 2m) between both year surveys, rather than an actual change.
В	None	Stable	This flush was previously mapped as inactive. However the southern section is now deemed to be active peat forming. This is the result of more comprehensive surveying in 2013 which resulted in more	

Table 8.2 Assessment of changes in individual Active Raised Bog areas

Area	Quadrats	Trend	Comment	Quadrats analysis
			accurate mapping as well as differences in vegetation interpretation.	
Degra	ded Raise	d Bog (7120)	

Area

The Degraded Raised Bog FRV for Area is 23.49ha at Cloonfelliv Bog. This value corresponds with the difference between the current high bog area (55.07ha) and the Active Raised Bog FRV (31.58ha) for area. Degraded Raised Bog is a particular habitat type, for which a FRV smaller than the current value, may be desirable in many sites. However any decrease in habitat area would only be considered positive, when it is the result of restoration to Active Raised Bog. Current habitat area is 131.63% bigger than FRV and therefore the habitat Area is given an **Unfavourable Bad** assessment (see table 8.4).

Table 8.3 indicates that there has been a decrease (0.14ha) in the area of Degraded Raised Bog. The decrease has occurred as a result of peat cutting and as a result the habitat is given a **Decreasing** trend.

The Area of Degraded Raised Bog at Cloonfelliv Bog is assessed as Unfavourable Bad-Decreasing (see table 8.5).

Structure & Functions

The FRV for S&Fs is for a maximum 25% of the Degraded Raised Bog area to be made up of marginal and face bank, i.e. the lower quality and drier vegetation communities. This value is 13.60ha (25% of 54.41ha, the current area of Degraded Raised Bog). The current marginal and face bank ecotopes area value (20.53ha) is 50.93% above the FRV (in the particular case of Degraded Raised Bog a current area value equal or smaller than FRV is desirable) (see Table 8.4). A current value more than 25% above FRV falls into the **Unfavourable Bad** assessment category.

S&Fs trend is assessed based on actual changes within marginal and face banks ecotope (e.g. decreases due to rewetting processes or increases as a result of further drying out). Table 8.3 shows that there has been a 0.09ha decrease in the area of marginal ecotope and a 0.05ha decrease in the area of facebank from 2004 to 2013, but this decrease has been as a result of direct loss of high bog to peat cutting. The area of sub-marginal ecotope has remained the same during the reporting period. Thus, the DRB's S&Fs at Cloonfelliv Bog are given a **Stable** trend.

The mapping of boundary between marginal and sub marginal is difficult and decreases are only recorded where major changes in the vegetation are evident. Therefore, where no changes are shown, more subtle negative effects cannot be ruled out, and therefore negative changes may have been underestimated. The basic assumption is that were peat cutting has taken place subsidence will occur and will continue for some decades and this will dry out the adjacent areas of the bog.

Typical good quality indicators and typical plant species are still found throughout the entire bog on sub-marginal ecotope.

The Structure & functions of Degraded Raised Bog at Cloonfelliv Bog are assessed as **Unfavourable Bad-Stable** (see table 8.5).

Future Prospects

The area of Degraded Raised Bog has decreased (by 0.14ha) as a result of peat cutting. This activity continues at the site to date. Furthermore, drainage on the high bog (0.968km of functional and reduced functional drains recorded) and cutover continues to damage the habitat and hinder its recovery to FRV's, as well as minimising the chances of converting marginal and facebank ecotopes to sub-marginal and/or Active Raised Bog. There are currently no remediation works at the site that might contribute to the restoration of good quality habitat. Habitat **Area** is currently 131.63% above FRV (see table 8.4) and a Decreasing trend is expected in the following two reporting periods (12 years) associated with peat cutting. As a result habitat Area is expected to remain more than 15% above FRV. Thus, habitat's **Area Future Prospects** are assessed as **Unfavourable Bad-Decreasing**. Habitat's **S&Fs** are currently 50.93% above FRV (see table 8.4). Although a Declining trend is foreseen in the following two reporting periods, **S&Fs** are expected to remain more than 25% above FRV. Thus, habitat's **S&Fs Future Prospects** are assessed as **Unfavourable Bad-Declining**.

Therefore the Future Prospects for Degraded Raised Bog are considered Unfavourable Bad-Declining (see table 8.5).

Inactive Ecotopes	1994/5 ¹	2004	2004 (amended)	2013	Change (2004-2013)	
	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	%
Sub- marginal	Na	30.98	33.07	33.07	0.00	0.00
Marginal ²	Na	19.89	19.61	19.52	(-)0.09	-0.46
Face bank ²	Na	2.33	1.06	1.01	(-)0.05	(-)4.72

Table 8.3 Changes in Degraded Raised Bog area

Inactive flush	na	0.81	0.81	0.81	0.00	0.00
Total	na	54.01	54.55	54.41	(-)0.14	(-)0.26

¹These are the figures calculated from the vegetation map drawn by Kelly *et al.*, (1995) that was geo-referenced, digitised and in some cases adjusted as part of Fernandez *et al.* (2005) project.

² Any 2013 marginal and face bank ecotope value given within the report should be taken as a maximum value. Their extent is based on the 2013 habitat survey and 2010 aerial photographs. It cannot be ruled out that further marginal and/or face bank ecotope losses may have taken place at the margin of the high bog in the 2011-2013 period associated with peat cutting.

Note: Table 8.3 includes 2004 figures and 2004 amended figures. The latter shows the ecotope area believed to be present in 2004 after surveying improvements in 2013. The comparison between 2004 (amended) and 2013 illustrates the actual changes in ecotope area in the 2004-2013 period. Any change in ecotope area between the 2004 and the 2004 (amended) values is due to improvement in mapping accuracy and/or the result of a more comprehensive survey in 2013.

The overall conservation status of Degraded Raised Bog at Cloonfelliv Bog is assessed as **Unfavourable Bad-Declining** (see table 8.5).

Depressions on peat substrates of the Rhynchosporion (7150)

Rhynchospora alba depressions are found across the entire bog in both Active and Degraded Raised Bog. The species is more frequently found and reaches its finest quality associated within wet features (*Sphagnum* pools, lawns and hollows) on Active Raised Bog.

The physical structure and distribution of the habitat across large sections of the high bog makes the process of calculating its area unfeasible and as a consequence makes the process of calculating realistic FRVs unfeasible. Thus, the assessment of the habitat's Area conservation status is indirectly based on the assessment of Active Raised Bog habitat Area (a favourable assessment indicates that all sub-marginal ecotope has turned Active Raised Bog). The habitat Area is given an **Unfavourable Bad** assessment.

The Area trend assessment is based on the variation on Active Raised Bog and sub-marginal ecotope within Degraded Raised Bog in the reporting period. The area of Active Raised Bog has remained unchanged in the reporting period, as has the area of sub-marginal ecotope. As result habitat Area is given a **Stable** trend.

The habitat's Area Future Prospects status is equally based on the Active Raised Bog Area Future Prospects status assessment and the Area Future Prospects trend is based on the trend expected for Active Raised Bog and sub-marginal ecotope in the following two reporting periods. Impacting activities such as peat cutting and drainage on the high bog and cutovers continue to threaten Active and Degraded Raised Bog. Therefore, the habitat's Area Future Prospects are given an **Unfavourable Bad-Decreasing** assessment.

The S&Fs conservation assessment is also indirectly based on the Active Raised Bog S&Fs status and trend assessments, as Active Raised Bog supports the finest habitat quality type. Therefore, the habitat's S&Fs are given an **Unfavourable Bad-Stable** assessment.

The habitat's S&Fs Future Prospects status and trend are equally based on the Active Raised Bog S&Fs Future Prospects status and trend assessments in the following two reporting periods. Therefore, the habitat's S&Fs Future Prospects are given an **Unfavourable Bad-Declining** assessment.

The overall habitat's Future Prospects assessment is Unfavourable Bad-Declining.

The conservation status of depressions on peat substrates of the Rhynchosporion at Cloonfelliv Bog is assessed as Unfavourable Bad-Declining (see table 8.5).

Habitat	Are	ea Assessment		Structure &	z Functions Ass	essment
	FRV Target	2013 value	% below	FRV 2013	2013 value	% below
	(ha) 1	(ha) ²	target	Target (ha) ³	(ha) 4	target
7110	31.58	0.66	97.91	0.33	0.14	57.58

Table 8.4 Habitats favourable reference values

¹2004 central, sub-central, active flush, bog woodland and sub-marginal ecotope area.

²2013 central, sub-central ecotope, active flush and bog woodland area.

³ Half of the current central, sub-central ecotope and active flush area. The target is that the area of the highest vegetation quality (i.e. central ecotope and active flush) should be at least this figure.

	FRV Target (ha) ⁵	2013 value (ha) ⁶	% above target	FRV 2013 Target (ha) ⁷	2013 value (ha) ⁸	% above target
7120	23.49	54.41	131.63	13.60	20.53	50.93

⁴2013 central ecotope and active flush area.

⁵Current high bog area minus 7110 area FRV.

⁶2013 Degraded Raised Bog area.

⁷ 25% of the current Degraded Raised Bog habitat area. The target is that the extent of marginal and face bank ecotopes should not be larger than 25% of the current Degraded Raised Bog habitat area. ⁸ Current marginal and face bank ecotopes area.

As table 8.5 below indicates, each individual EU habitat present on the high bog has been given the following overall conservation status assessment based on the three main parameters (Area, S&Fs and Future Prospects) individual assessments:

Active Raised Bog is assessed as being Unfavourable Bad–Declining.

- Degraded Raised Bog is assessed as being Unfavourable Bad-Declining.
- Rhynchosporion depressions is assessed as being Unfavourable Bad-Declining.

Table 8.5 Habitats conservation status assessments				
Habitat	Area Assessment	Structure & Functions Assessment	ructure & Future Prospects Functions Assessment Overall Asses	
7110	Unfavourable	Unfavourable Bad-	Unfavourable Bad-	Unfavourable Bad-
	Bad-Stable	Stable	Declining	Declining
7120	Unfavourable	Unfavourable Bad-	Unfavourable Bad-	Unfavourable Bad-
	Bad-Decreasing	Stable	Declining	Declining
7150	Unfavourable	Unfavourable Bad-	Unfavourable Bad-	Unfavourable Bad-
	Bad-Stable	Stable	Declining	Declining

Conclusions

Summary of impacting activities

- Peat cutting still continues at the site and has taken place at 3 locations on the high bog and an additional one on the cutover in the 2004/5-2010 reporting period. 0.14ha of high bog have been lost in this period due to peat cutting.
- 0.332km of drains on the high bog remain functional with an additional 0.636km classed as reduced functional.
- Cutover drainage (peripheral drainage) associated with either currently active or no longer active peat cutting continues to impact on the high bog habitats. In addition, maintenance works have been carried out in the reporting period on drains in agriculture land to the southeast of the high bog.
- No fire events have damaged the high bog in the reporting period and most of the high bog has apparently remained unburned for over 30 years.

Changes in active peat forming areas

- There has been no change in the total area of Active Raised Bog at Cloonfelliv Bog in the 2004 to 2013 period. However, there have been some minor changes to the boundaries of the habitat, although all such changes are attributed to the more comprehensive mapping exercise employed in the current survey or to vegetation re-interpretation.
- There have been minor changes to the boundary of Sc1 and Sc2, which are attributed to the increased mapping effort in 2013.

• The southern part of Flush B is now mapped as active flush in 2013. However, the 2013 description of this flush is very similar to that described in 2004 and thus the mapping difference is attributed to vegetation interpretation differences between the two surveys.

Other changes

- There have been numerous revisions of ecotope boundaries of marginal/sub-marginal on the high bog resulting from more comprehensive surveying, and differences in the interpretation of habitats.
- The boundaries of the inactive flushes **A** and **B** have been slightly modified, while two new small inactive flushes **C** and **D** have been described, also as a result of the increased mapping effort in 2013.

Quadrats analysis

Quadrat Qsc1: very similar to 2004 quadrat data: the cover of pools and the overall *Sphagnum* cover have remained the same. However, the covers of *S. cuspidatum* and *S. denticulatum* have increased slightly while there has been a slight decrease in the cover of *S. austinii*. However, these changes may merely be the result of a discrepancy in the quadrat location (up to 2m) between both year surveys, rather than an actual change.

Restoration works

- No restoration works have been undertaken at the site.
- NPWS has engaged in negotiation with landowners in relation to the cessation of peat cutting at the site. Despite negotiations peat cutting continues at Cloonfelliv Bog.

Summary of conservation status

- Active Raised Bog has been given an Unfavourable Bad–Declining conservation status at Cloonfelliv Bog. Habitat Area and quality (S&Fs) have remained unchanged in the reporting period. However both of these assessment criteria are currently substantially below the FRVs. Future Prospects are considered Unfavourable Bad-Declining as impacting activities (peat cutting and drainage) continue to threaten the habitat.
- Degraded Raised Bog has been given an Unfavourable Bad-Declining conservation status at Cloonfelliv Bog. The habitat Area has decreased due to peat cutting. S&Fs have remained Stable. Both Area and S&Fs are above FRVs, which is deemed negative for the habitat. Future Prospects are considered Unfavourable Bad-Declining due to threatening impacting activities.

 Depressions on peat substrates of the Rhynchosporion has been given an Unfavourable Bad-Declining conservation status at Cloonfelliv Bog. The habitat Area and S&Fs have remained stable. Future Prospects are considered Unfavourable Inadequate – Declining due to threatening impacting activities.

The conservation status of the **overall raised bog** at **Cloonfelliv Bog** is assessed as being **Unfavourable Bad-Declining**.

Recommendations

- · Cessation of peat cutting.
- **Restoration works** including blocking of high bog reduced-functional and functional drains.
- **The blocking of cutover drains** is also to be recommended. There is potential for the restoration of cutover around the entire site, but particularly in the north-west as the cutover is most extensive there. This may be particularly important as reaching the ARB target on the high bog alone may not be achievable.
- Further hydrological and topographical studies to ascertain the capacity of the high bog to support Active Raised Bog and thus estimate a more accurate favourable reference value. Hydrological studies should also aim to understand the impacts on the bog arising from regional drainage works, particularly on the river/stream, which runs between Cloonfelliv Bog and Moorfield Bog/Farm Cottage to the west.
- Further botanical monitoring surveys on the high bog in order to assess changes in the conservation status of habitats, and also potentially, monitoring surveys of cutover areas if they become part of future restoration programmes at the site.

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Appendix I Detailed vegetation description of the high bog

Active Raised Bog (7110)

Central Ecotope Complex

There was no Central ecotope recorded at Cloonfelliv Bog.

Sub-Central Ecotope Complexes

COMPLEX 9A/10

- Location: this complex is found within Sc1 at the north end of the bog
- · Ground: quaking/open water
- Physical indicators: absent
- Calluna height: 11-20cm
- *Cladonia* cover: <4%
- Macro-topography: gentle slope
- **Pools**: 76-90%
- Sphagnum cover: 76-90%
- *Narthecium* cover: <4%
- Micro- topography: Pool dominated with lawns/low hummocks
- Tussocks: absent
- · Degradation or regeneration evidence: absent
- Species cover: Calluna vulgaris (4-10%), Eriophorum angustifolium (11-25%), E. vaginatum (<4-10%), Rhynchospora alba (<4%), Carex panicea (<4%), Rhynchospora alba (<4%), Trichophorum germanicum (<4%), Menyanthes trifoliata (<4%), Sphagnum cuspidatum (P; 34-50%), S. denticulatum (P; 4-10%), S. capillifolium (H; 11-25%), S. papillosum (H; 11-25%), S. palustre (<4%).
- Additional comments: This is essentially a large pool (ca. 15m x 7m) full of *Sphagnum cuspidatum* with lawns and low hummocks of other *Sphagnum* spp. growing in and adjacent to the pool.

Quadrat **Qsc2** was taken within this complex.

- Location: This complex is found within Sc2 at the centre of the bog and localised areas immediately north of this
- Ground: soft
- Physical indicators: absent
- Calluna height: 21-30cm
- Cladonia cover: 26-33%
- Macro-topography: gentle slope
- **Pools**: 11-25%
- Sphagnum cover: 34-50%
- · Narthecium cover: absent
- Micro- topography: hummocks/hollows/pools
- Tussocks: absent
- · Degradation or regeneration evidence: absent
- Species cover: Calluna vulgaris (11-25%), Eriophorum angustifolium (<4%), E. vaginatum (11-25%), Rhynchospora alba (4-10%), Carex panicea (<4%), Trichophorum germanicum (<4%), Menyanthes trifoliata (<4%), Sphagnum cuspidatum (P; 4-10%), S. denticulatum (<4%), S. capillifolium (H; 11-25%), S. papillosum (H; 11-25%), Aulacomnium palustre (<4%), Polytrichum strictum (<4%).
- Additional comments: This community complex is slightly flushed in places. The inter-pool
 areas are quite soft and spongy underfoot, but overall the area is considered to be borderline
 sub-marginal/sub-central.

Quadrat **Qsc1** was taken within this complex.

Active flushes

FLUSH B

- Location: South-western side of site
- **Ground**: firm to soft
- Physical indicators: absent
- Calluna height: 21-30cm
- Cladonia cover: 11-25%
- · Macro-topography: depression
- **Pools**: absent
- Sphagnum cover: 11-25%

- · Narthecium cover: absent
- Micro- topography: hummocks/hollows
- **Tussocks**: *Molinia caerulea* <4%
- · Degradation or regeneration evidence: absent
- Species cover: Calluna vulgaris (26-33%), Molinia caerulea (<4%; 34-50% in the inactive part), Phragmites australis (<4%), Eriophorum angustifolium (4-10%), E. vaginatum (4-10%), Vaccinium oxycoccos (<4%), Sphagnum capillifolium (H; 11-25%), S. fallax (Hl; <4%), Polytrichum strictum (<4%), Hylocomium splendens (<4%), Pleurozium schreberi (4-10%).
- Additional comments: This is a small flushed area, with abundant heather. It is partly active (generally where the vegetation is dominated *Calluna vulgaris* and *Eriophorum vaginatum*) and partly inactive where *Molina caerulea* dominates. The surface is soft underfoot in the active areas and the *Sphagnum* cover is higher (34-50%).

Degraded Raised Bog (7120)

Sub-Marginal Ecotope Complexes

COMPLEX 9/7/3+P

- Location: North-east and scattered throughout the site
- Ground: soft, inter-pool areas firm in places
- Physical indicators: absent
- · Calluna height: 21-30cm
- Cladonia cover: 11-25%
- Macro-topography: gentle slope
- **Pools**: 11-25% irregular shape, some interconnecting
- Sphagnum cover: 26-33%
- Narthecium cover: 4-10%
- · Micro- topography: Low hummocks/hollows/pools
- **Tussocks**: Eriophorum vaginatum (<4%)
- · Degradation or regeneration evidence: absent
- Species cover: Calluna vulgaris (11-25%), Erica tetralix (<4%), Eriophorum vaginatum (4-10%, locally 11-25%), E. angustifolium (4-10%), Narthecium ossifragum (<4%), Carex panicea (4-10%), Rhynchospora alba (<4%), Sphagnum capillifolium (H; 11-25%), S. papillosum (H; 4-10%), S. cuspidatum (4-10%), S. denticulatum (<4%).

• Additional comments: This is a relatively good quality sub-marginal community complex. Generally the pools have good *Sphagnum* cover in the water and around the edges. However, the high *Cladonia* cover on the hummocks seems to have displaced the *Sphagnum* in places. A variant of this is complex 9/7/3 where pools are absent. *Eriophorum* spp. are an important part of the complex and *Carex panicea* is a constant.

COMPLEX 9/7/3

- Location: southern half of high bog
- · Ground: soft
- Physical indicators: absent
- · Calluna height: 21-30cm
- Cladonia cover: 11-25% (4-10% in places)
- Macro-topography: flat/gentle slope
- Pools: absent
- Sphagnum cover: 26-33%
- *Narthecium* cover: <4% (4-10% in places)
- · Micro- topography: Poorly developed hummocks/hollows
- Tussocks: absent
- · Degradation or regeneration evidence: absent
- Species cover: Calluna vulgaris (26-33%), Erica tetralix (<4%), Eriophorum vaginatum (4-10%; locally 11-25%), E. angustifolium (4-10%; 11-25% in places), Narthecium ossifragum (<4%), Carex panicea (4-10%), Trichophorum germanicum (<4%), Racomitrium lanuginosum (<4%), Sphagnum capillifolium (H; 11-25%), S. papillosum (H; 4-10%), S. tenellum (H; <4%), S. cuspidatum (HI; <4%).
- Additional comments: Where there is a high *Cladonia* cover on the hummocks, it seems to have displaced the *Sphagnum* in places.

COMPLEX 9/7

- Location: east of high bog (south of drain d7)
- · Ground: firm to soft
- Physical indicators: absent
- Calluna height: 31-40cm
- *Cladonia* cover: <4%
- Macro-topography: flat/gentle slope
- · Pools: absent

- Sphagnum cover: 34-50%
- *Narthecium* cover: <4%
- Micro- topography: Poorly developed hummocks/hollows
- **Tussocks**: Eriophorum vaginatum (26-33%)
- · Degradation or regeneration evidence: absent
- Species cover: Calluna vulgaris (26-33%), Erica tetralix (<4%), Eriophorum vaginatum (26-33%), E. angustifolium (<4%), Narthecium ossifragum (<4%), Carex panicea (<4%), Trichophorum germanicum (<4%), Sphagnum capillifolium (H; 4-10%), S. papillosum (H; 11-25%), S. tenellum (H; <4%), S. cuspidatum (HI; 4-10%).
- Additional comments: This area appears to have been surface cut in the past as there are parallel ridges of *Calluna* and wet hollows infilled with *Sphagnum cuspidatum*.

COMPLEX 9/7+CL

- Location: southern half of high bog
- Ground: soft
- Physical indicators: absent
- · Calluna height: 21-30cm
- Cladonia cover: 34-50% (>50% in places)
- Macro-topography: gentle slope
- **Pools**: absent
- Sphagnum cover: 26-33% (11-25% in places)
- · Narthecium cover: absent
- · Micro- topography: Low hummocks/hollows
- **Tussocks**: Eriophorum vaginatum (<4%)
- Degradation or regeneration evidence: absent
- Species cover: Calluna vulgaris (11-25%), Eriophorum vaginatum (4-10%, locally 11-25%), E. angustifolium (4-10%), Sphagnum cuspidatum (<4%), S. capillifolium (H; 11-25%), S. papillosum (H; 4-10%), S. tenellum (<4%).
- Additional comments: This complex is characterised by the high *Cladonia* cover, presence of *Eriophorum* spp. and low cover/absence of *Narthecium* and *Carex panicea*. Although the ground feels soft, the *Sphagnum* tends to be covered over and displaced by the *Cladonia*.

COMPLEX 6/3+P

• Location: surrounding Sc2 and in the northern section of high bog

- · Ground: soft
- Physical indicators: absent
- Calluna height: 11-20cm
- Cladonia cover: 11-25%
- Macro-topography: gentle slope
- **Pools**: 11-25% (4-10% in places)
- Sphagnum cover: 11-25%
- Narthecium cover: 4-10%
- · Micro- topography: Low hummocks hollows and pools but dominated by flats
- Tussocks: absent
- · Degradation or regeneration evidence: absent
- Species cover: Calluna vulgaris (11-25%), Erica tetralix (<4%), Eriophorum vaginatum (4-10%), E. angustifolium (<4%), Carex panicea (11-25%), Narthecium ossifragum (4-10%), Rhynchospora alba (<4%; higher in places), Campylopus atrovirens (<4%), Sphagnum capillifolium (H; 4-10%), S. papillosum (H; 4-10%), S. tenellum (H; <4%), S. austinii (H; <4%), S. fuscum (H; <4%), S. cuspidatum (P; <4%), S. denticulatum (P; <4%), Cladonia portentosa (11-25%), C. uncialis (<4%).
- Additional comments: This is a relatively poor quality sub-marginal complex. The inter-pool areas are dominated by flats with occasional high hummocks and the cover of *Sphagnum* in the pools is poor and patchy.

COMPLEX 6/3/9

- · Location: scattered across entire site sub-marginal ecotope
- · Ground: soft
- Physical indicators: absent
- · Calluna height: 11-20cm
- Cladonia cover: 11-25%
- Macro-topography: flat/gentle slope
- **Pools**: absent (<4% in places)
- Sphagnum cover: 11-25%
- *Narthecium* cover: 4-10% (11-25% in places)
- · Micro- topography: Low hummocks/hollows but dominated by flats
- Tussocks: absent
- · Degradation or regeneration evidence: absent

- Species cover: Calluna vulgaris (11-25%; 26-33% in places), Erica tetralix (<4%), Eriophorum vaginatum (4-10%), E. angustifolium (<4%; 4-10% in places), Carex panicea (11-25%), Narthecium ossifragum (4-10%), Trichophorum germanicum (<4%), Sphagnum capillifolium (H; 4-10%), S. papillosum (H; 4-10%), S. tenellum (H; <4%), S. fuscum (H; <4%), S. cuspidatum (HI; <4%), Cladonia portentosa (11-25%).
- Additional comments: Some hollows are comprised of all *Narthecium ossifragum* and as the leaves are dead, (at time of survey) bare peat is exposed.

Marginal Ecotope Complexes

COMPLEX 3/6

- Location: high bog edge to the north and south of the site
- **Ground:** firm to soft
- Physical indicators: absent
- Calluna height: 11-20cm
- Cladonia cover: 11-25%
- Macro-topography: gentle slope
- **Pools**: absent (<4% in places)
- Sphagnum cover: 4-10%
- Narthecium cover: 11-25%
- Micro- topography: Low hummocks/hollows but dominated by flats
- Tussocks: absent
- · Degradation or regeneration evidence: absent
- Species cover: Calluna vulgaris (11-25%), Erica tetralix (<4%), Eriophorum vaginatum (<4%; 4-10% in places), E. angustifolium (<4%), Carex panicea (11-25%), Narthecium ossifragum (4-10%; 11-25% in places), Myrica gale (<4%), Sphagnum capillifolium (H; 4-10%), S. papillosum (H; 4-10%), S. cuspidatum (<4%), Cladonia portentosa (11-25%), C. uncialis (<4%).
- Additional comments: This complex supports a 4-10% cover of pools in places to the northeast of the site and in these areas the complex is termed 3/6 + P. *Myrica gale* cover is >10% in parts of the north-east of the site and in these areas the complex is termed 3/6 + *My*.

In the west of the high bog, this complex has an increased cover of *Trichophorum germanicum* (4-10%), mainly in tussock form and in this area the complex is termed 3/6/2. The cover of *Racomitrium lanuginosum* and *Narthecium ossifragum* (11-25%) is higher and that of *Eriophorum vaginatum* (<4%) and *Cladonia portentosa* (4-10%) is lower.

Inactive flushes

FLUSH A

- Location: Northern perimeter of the high bog
- **Ground**: firm to soft
- Physical indicators: absent
- Calluna height: 21-30cm
- Cladonia cover: 4-10%
- · Macro-topography: gentle slope
- Pools: absent
- *Sphagnum* cover: 4-10% (11-25% in places)
- *Narthecium* cover: <4% (largely absent)
- Micro- topography: n/a
- Tussocks: absent
- · Degradation or regeneration evidence: absent
- Species cover: Molinia caerulea (34-50%), Calluna vulgaris (4-10%), Erica tetralix (<4%), Myrica gale (<4%), Eriophorum vaginatum (<4%), E. angustifolium (<4%), Carex panicea (4-10%), Racomitrium lanuginosum (<4%), Sphagnum capillifolium (H; 4-10%), S. papillosum (H; <4%), S. cuspidatum (<4%).
- · Additional comments: None.

FLUSH C

- Location: South-eastern perimeter of the high bog
- · Ground: soft
- Physical indicators: absent
- Calluna height: 41-50cm
- Cladonia cover: 4-10%
- · Macro-topography: gentle slope
- Pools: absent
- Sphagnum cover: 26-33%
- *Narthecium* cover: <4%
- Micro- topography: n/a
- Tussocks: absent
- · Degradation or regeneration evidence: absent

- Species cover: Molinia caerulea (11-25%), Calluna vulgaris (11-25%), Eriophorum vaginatum (11-25%; 4-10% in places), E. angustifolium (<4%), Carex panicea (4-10%), Vaccinium oxycoccos (<4%), Potentilla erecta (<4%), Polytrichum strictum (<4%), Sphagnum capillifolium (H; 26-33%), S. papillosum (H; <4%), S. cuspidatum (<4%).
- Additional comments: Parts of this flush may be on old cutover. There is also an area within this flush with a band of *Phragmites australis* that has a slightly lower *Sphagnum* cover (11-25%). The cover of *Cladonia portentosa* is higher in this area (34-50%). A 0.5m *Rhododendron ponticum* is also resent within this flush. At the eastern extent of this flush, running along the edge of the north-south drain there are old cut tree stumps with *Rubus fruticosus, Succisa pratensis, Campylopus introflexus, Juncus effusus, Dicranum scoparium* and *Hylocomium splendens*.

FLUSH D

- · Location: North-west of the site, just south of the county boundary line
- Ground: firm
- Physical indicators: absent
- Calluna height: 31-50cm
- Cladonia cover: 4-10%
- Macro-topography: gentle slope
- Pools: absent
- Sphagnum cover: 11-25%
- Narthecium cover: 4-10%
- Micro- topography: Low hummocks/hollows
- Tussocks: absent
- Degradation or regeneration evidence: absent
- Species cover: Calluna vulgaris (34-50%), Vaccinium myrtillus (11-25%), Molinia caerulea (<4%), Eriophorum vaginatum (<4-10%), E. angustifolium (<4%) Carex panicea (<4%), Vaccinium oxycoccos (<1%), Aulacomnium palustre (<4%), Polytrichum strictum (<4%), Sphagnum capillifolium (H; 11-25%), S. fallax (H; <4%), Hylocomium splendens and Pleurozium schreberi (26-33%).
- Additional comments: This is a small heather-dominated mound with various species indicative of some flushing.

Face bank Complexes

COMPLEX 1

- Location: this complex was found along the bog margin
- · Ground: firm
- **Physical indicators**: bare peat (4-10%)
- Calluna height: >50cm
- Cladonia cover: <4%
- · Macro-topography: steep slope
- Pools: absent
- *Sphagnum* cover: 4-10% (less in places)
- *Narthecium* cover: <4%
- Micro- topography: tall robust Calluna vulgaris/low hummocks
- **Tussocks:** *Trichophorum germanicum* (<4%)
- · Degradation or regeneration evidence: absent
- **Species cover**: *Calluna vulgaris* (76-90%), *Trichophorum germanicum* (<1%), *Narthecium ossifragum* (<4%), *Sphagnum capillifolium* (H; <4%), *S. tenellum* (H; <4%), *Hypnum jutlandicum* (4-10%).
- Additional comments: none

Depressions on peat substrates of the Rhynchosporion (7150)

The habitat occurs at Cloonfelliv Bog in both Active and Degraded Raised Bog, but it is only occasional found on degraded habitat. Only *Rhynchospora alba* was recorded within the 2013 survey at this site.

R. alba is found in all ecotopes in Cloonfelliv Bog, such as: sub-central ecotope (9A/10; 9/7 + P); sub-marginal ecotope (9/7/3 + P; 6/3 + P) and marginal ecotope (3/6+P).

The species becomes very frequent within complexes 9/7 + P (sub-central) and 6/3 + P (sub-marginal).

The species is always found associated with wet features such as *Sphagnum* pools, *Sphagnum* lawns and hollows, along with *Sphagnum magellanicum*, *S. papillosum*, *S. cuspidatum*. It was also found within *Narthecium ossifragum* dominated hollows in sub-marginal and marginal ecotope complexes.

Appendix II Photographical records

Photograph Number	Aspect	Туре	Feature	Date
DSCN0858	NE	Overview	Qsc1	07/02/2013
DSCN0864	NE	Overview	Qsc2	07/02/2013

Appendix III Quadrats

Ecotope type	Sub-central	Sub-marginal	Sub-central
Complex Name	9/7+P	9/7+P	9a/10
Quadrat Name	Qsc1	Qsc1	Qsc2
Easting	165207	165207.78	165399.25
Northing	274061	274059.17	274388.65
Date	02/11/2004	07/02/2013	07/02/2013
Firmness	firm-soft	Soft	Quaking
Burnt	No	No	No
Algae in hollows %	Absent	Absent	Absent
Algae in pools %	1-3 (few indiv)	1-3 (many indiv)	Absent
Bare peat %	Absent	Absent	Absent
High hummocks %	na	Absent	Absent
Low hummocks %	11-25	51-75	Absent
Hollows %	11-25	4-10	Absent
Lawns %	Absent	4-10	4-10
Pools %	4-10	4-10	91-100
Pool type	Tear	Regular	Regular
S.austinii hum type	na	Absent	Absent
S.austinii hum %	1-3 (few indiv)	Absent	Absent
S.austinii height(cm)	na	Absent	Absent
S.fuscum hum type	na	Absent	Absent
S.fuscum hum %	na	Absent	Absent
S.fuscum height(cm)	na	Absent	Absent
Leucobryum glaucum	na	Absent	Absent
Trichophorum type	Absent	Absent	Absent
Trichophorum %	Absent	Absent	Absent
S.magellanicum %	Absent	Absent	Absent
S.cuspidatum %	1-3 (few indiv)	4-10	51-75
S.papillosum %	4-10	4-10	11-25
S.denticulatum %	na	1-3 (several indiv)	4-10
S.capillifolium%	11-25	11-25 4-10	
S.tenellum %	na	1-3 (many indiv) Absent	

Ecotope type	Sub-central	Sub-marginal	Sub-central
Complex Name	9/7+P	9/7+P	9a/10
S.subnitens %	na	Absent	Absent
R.fusca %	na	Absent	Absent
R.alba %	1-3 (few indiv)	1-3 (many indiv)	1-3 (many indiv)
N.ossifragum %	1-3 (few indiv)	Absent	1-3 (few indiv)
Sphag pools %	4-10	4-10	91-100
Dominant pool Sphag	na	S.cuspidatum	S.cuspidatum
Sphag lawns %	Absent	4-10	4-10
Sphag humm %	11-25	11-25	Absent
Sphag holl %	11-25	1-3 (many indiv)	Absent
Total Sphag %	34-50	34-50	91-100
Hummocks indicators	S.austinii	Absent	Absent
Cladonia portent %	26-33	34-50	1-3 (several indiv)
Other Cladonia sp	na	C.uncialis	C.uncialis
C. panicea %	na	1-3 (many indiv)	1-3 (few indiv)
Calluna cover %	4-10	26-33	1-3 (several indiv)
Calluna height(cm)	21-30	21-30	11-20
		E.vag 4-10, E.ang 4-10,	
Other NotableSpecies		V.oxy Dicranum. Pine	E.ang 26-33, E.vag 4-10,
		seedling 2cm	Menyanthes
Other comment		S. austinii adj to quad	

Note: Data for those 2004 quadrats re-surveyed in 2013 is given to the right of the original 2004 quadrat data in table above. Not all quadrats reported in 2004 were re-surveyed in 2013. Nonetheless, all 2004 quadrat data is given above. Additional quadrats were recorded where necessary. Some 2004 quadrats may have been classified under a different ecotope category in 2013; further detail is given within the report.

Appendix IV Survey maps





