# Ballykenny Bog (SAC 001818), Co. Longford

#### **Executive Summary**

This survey, carried out in October 2011, aimed to assess the conservation status of habitats listed on Annex I of the European Habitats Directive (92/43EEC) on the high bog at Ballykenny 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 7.57ha (4.19%) of the high bog area. The highest quality example of Active Raised Bog consists of *Sphagnum* lawns, hummocks and pools. *Sphagnum* cover reaches 90% in certain locations. Active Raised Bog also includes some active peat forming flushes.

Degraded Raised Bog covers 173.24ha (95.81%) 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. This habitat also included 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.

Restoration works took place at the site in 2003 including the blocking of high bog drains and cutover drains in the southeast.

The current conservation objective for Ballykenny 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 130.21ha. 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 a slight increase in the area of Active Raised Bog (5.06ha) at Ballykenny Bog in the 2004 to 2011 period. Several new peat forming areas have developed at the site as a result of rewetting processes associated with the blocking of drains. This has been particularly significant along the northern section of high bog and particularly to the north-east. In addition, other sub-central ecotope sections have expanded too. On the other hand, some sections previously deemed sub-central ecotope (community complex 9/7/10) have been reclassified as sub-marginal ecotope indicating that, further drying out processes and actual habitat losses may have taken place within some sections dominated by this complex (Sc2).

Cutover drainage and reduced functional high bog drains are the highest impacting activities at the site. Peat cutting no longer takes place at the site. Invasive species *Pinus sylvestris* and *Rhododendron ponticum* are found across many sections of the high bog and densely cover cutover areas. However, these do not seem to be spreading further on the high bog and thus are not deemed a major threat to high bog habitats.

Active Raised Bog has been given an overall Unfavourable Bad-Improving conservation status assessment. Habitat Area has slightly increased and quality improved in the reporting period. However, both are below the favourable reference values. Future Prospects are considered Unfavourable Bad-Improving.

**Degraded Raised Bog** has been given an overall **Unfavourable Bad-Improving** assessment as there has been some restoration to Active Raised Bog. Sub-marginal ecotope area has considerably increased as a result of re-wetting processes.

**Rhynchosporion depressions** has been given an overall **Unfavourable Bad-Improving** conservation status as there has been some restoration to Active Raised Bog and no further drying of the high bog.

## The **overall raised bog** at **Ballykenny SAC** has been given an **Unfavourable Bad-Improving** assessment.

A series of **recommendations** have been also given, these include: further hydrological and topographical studies to ascertain more accurate FRVs; further botanical surveys on the high bog and cutover to assess the efficiency of restoration works and an impact assessment of maintenance works on adjacent land drainage with a view to the potential of blocking these drains.

#### Site identification

SAC Site Code	001818	6" Sheet:	LF: 8		
Grid Reference:	E 208400 / N 278800	1:50,000 Sheet:	40		
High Bog area (ha)1:	180.81ha				
Dates of Visit:	10 to 11/10/11				
Townlands:	Castleforbes Demesne and Killeen				

#### Site location

Ballykenny Bog is located in Co. Longford, 6.5km northeast of Longford town. Kelly *et al.* (1995) grouped Ballykenny Bog with the raised bogs of Longford/E Roscommon. It lies approximately 2km to the north of Brown Bog (SAC 2346) and immediately north of Fisherstown Bog (SAC 1818).

Lough Forbes lies to the west of the site, while the Camlin River runs to the south. Castle Forbes Estate borders the northern edge. Corlehan Wood that is a mixed woodland lies between Lough Forbes and the bog on the western edge.

#### Description of the survey

The survey was carried out in October 2011 and involved a vegetation survey of the high bog at Ballykenny 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

<sup>1</sup> This figure is slightly smaller than the one given in 2004, as a result of improvement on mapping accuracy; based on 2010 aerial photography.

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 Ballykenny 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.

The 2011 survey did not look at cutover. The survey of cutover would require a new methodology which would include assessments of cutover and lag zone vegetation.

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

Ballykenny Bog is situated at a wide point in the River Shannon valley and lies in its former floodplain, and has been classified as a Broad Floodplain Bog type (Kelly *et a.l.*, 1995). Overall this site is rather flat particularly the southern section where there is only a gradual slope to the bog edge. The steeper slopes are confined to the areas to the southeast and towards the large drains in the northern part of the site.

#### **Ecological information**

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

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

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

#### Active Raised Bog (7110)

The current area of Active Raised Bog at Ballykenny Bog is 7.57ha (4.19% of the high bog), which is a decrease of 47.8ha since 1994.

Active Raised Bog includes sub-central ecotope as well as active flushes. Central ecotope is not present.

Sub-central ecotope is found in Ballykenny Bog at thirteen locations (Sc1 to Sc13) (see Appendix IV, Map 1). The highest quality and wetter Active Raised Bog sections consist of sub-central ecotope (vegetation community complexes 10/9) and active flush (flush Y). The Sphagnum cover in Complex 10/9 ranges from 51 to 75%, and the micro-topography consists of *Sphagnum* hummocks, lawns and pools. Sphagnum capillifolium and S. papillosum dominate the hummocks layer, S. magellanicum the lawns layer and occasionally S. cuspidatum the pools layer. S. austinii hummocks are also resent. Abundant Eriophorum vaginatum characterises this complex. This complex is located in areas where rewetting after the blocking of drains is taking place. Complex 9/10 is the most widespread subcentral ecotope complex at the site and consists of hummocks and hollows. *Sphagnum* cover is lower than at complex 10/9, but abundant E. vaginatum also characterises this complex. Sphagnum cover increases (76-90%) in some newly developed patches such as Sc1 and Sc13. However, the microtopography is poorly developed compared to complex 10/9. Complex 9/7/10 is also widespread. The micro-topography consists of Sphagnum hummocks (mainly S. capillifolium) and many sections feature flush type species: Vaccinium oxycoccos, Polytrichum strictum and Aulacomnium palustre. This complex is also recorded in many areas where Active Raised Bog has recently developed after the blocking of drains.

The site also features a small section of active flush within the large flush Y to the north of the high bog. This section consists of *Sphagnum* lawns and hummocks dominated by *S. magellanicum*, *S. capillifolium*, *S. palustre*, *S. fallax* and *S. cuspidatum*.

Western indicators *Racomitrium lanuginosum and Pleurozia purpurea* were recorded within Active Raised Bog, but also within Degraded Raised Bog.

#### Degraded Raised Bog (7120)

The current area of Degraded Raised Bog at Ballykenny Bog is 173.24ha (95.81% 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, with a higher presence of *Sphagnum* hummocks and hollows (frequently dominated by *Narthecium ossifragum* and only occasionally *Sphagnum cuspidatum* and *S. tenellum*). Complex 9/7 (sub-marginal) is the most developed within the habitat and is mostly found adjacent to sub-central ecotope areas. The micro-topography consists of hummocks and hollows. *Sphagnum* covers up to 33% of the ground and mostly consists of *S. capillifolium*. *S. papillosum*, *S. magellanicum*, *S. tenellum*, *S. subnitens* and *S. cuspidatum* are also present. Very occasionally *S. austinii* and *S. fuscum* hummocks are found. *Calluna vulgaris*, *Erica tetralix*, *Eriophorum vaginatum*, *E. angustifolium*, *Rhynchospora alba*, *N. ossifragum* and *Trichophorum germanicum* are also common at various degrees of coverage across the high bog. *N. ossifragum* becomes more frequent within complex 9/7/6, which is the most widespread sub-marginal ecotope complex at the site.

Marginal ecotope is slightly drier than sub-marginal ecotope and covers a very small portion of the margins of the high bog. The micro-topography consists of *C. vulgaris* hummocks, low *Sphagnum* hummocks, flats and very occasionally hollows. The *Sphagnum* cover is even lower here than in the sub-marginal ecotope (<10%) and the vegetation is characterised by higher cover of *N. ossifragum*, *T. germanicum* and *C. vulgaris*.

Face bank ecotope is characterised by firm ground, tall *C. vulgaris*, poor *Sphagnum* cover and flat micro-topography. One mound raised from the surrounding high bog expanse is also found to the south of flush Y. This mound is dominated by face bank ecotope consisting of dry *C. vulgaris* and has little or no *Sphagnum* cover.

The high bog also features scattered Betula pubescens and Pinus sylvestris trees.

#### Depressions on peat substrates of the Rhynchosporion (7150)

Rhynchosporion vegetation is widespread on Ballykenny 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 along pool edges and on lawns underlain by deep, wet and quaking peat. 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 pools, hollows, erosion channels or depressions.

#### Detailed vegetation description of the high bog

A detailed description of high bog vegetation recorded during the 2011 survey of Ballykenny 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 Ballykenny 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; see section 7):

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Code	Activity	Ranking	Influence	Area (ha) /Length(km) affected	Location	Habitat affected
J02.07	Drainage	М	-1	25.929km 1	On HB	7110/7120/7150
J02.07	Drainage	М	-1	n/av	Adjacent to HB	7110/7120/7150
I01	Invasive alien species	L	-1	<0.5ha <sup>2</sup>	On HB	7110/7120/7150

Гal	ble	6.1	Impacting	activities
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4.2	Restoring/Improving the hydrological regime	Н	+1	25.929km <sup>2</sup>	On HB	7110/7120/7150
4.2	Restoring/Improving the hydrological regime	Н	+1	Unknown	Adjacent to HB	7110/7120/7150

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

<sup>1</sup> This figure only includes functional and reduced-functional drains (some of them blocked).

<sup>2</sup> This figure is estimated and represents the extent of trees across entire high bog

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

#### Peat cutting

Peat cutting no longer takes place at Ballykenny Bog. Fernandez *et al.* (2005) already mentioned the absence of peat cutting during the 2004 survey. However some cutting activity took place in the 1995-2000 period.

Nevertheless, old face banks and cutover drainage associated with past cutting along the eastern section of the site are likely to continue to cause negative impacts on the high bog habitats.

#### Drainage

#### High bog drainage

There have been no major changes in the status of high bog drains. Infilling has continued taking place within the blocked drains and as a result Active Raised Bog and sub-marginal ecotope have expanded within some of these restored sections.

Overall, the majority of drains in the high bog remain reduced functional (25.929km). Some of the reduced functional drains (e.g. bM water running recorded at the western edge) are impacting the high bog habitats and will continue to do so until they become completely in-filled and thus non-functional.

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

Raised Bog Monitoring & Assessment Survey 2013-Ballykenny (SAC 001818)

Status	2004 (km) <sup>1</sup>	2011 (km)	Change
NB: functional	n/a	n/a	n/a
NB: reduced functional	n/a	n/a	n/a
NB: non- functional	0.451	0.451	0.000
B: functional	n/a	n/a	n/a
B: reduced functional	25.929	25.929	0.000
B: non- functional	n/a	n/a	n/a

Table 6.2 High bog drainage summary

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

<sup>1</sup> High bog drainage has been revised (e.g. re-digitised in cases) and figures above may slight vary 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 Ballykenny Bog including any change in their functionality in the 2004 – 2011 reporting period (see Map 3).

Drain Name	Length (km)	2004 status	2011 status	Change	Comment
bB1	1.143	B: reduced functional	B: reduced functional	No	Running water noted in the western section (GR 2784443/208086); Infilling taking place
bB2	1.102	B: reduced functional	B: reduced functional	No	Infilling taking place
bC	0.092	NB: non- functional	NB: non- functional	No	
bE	0.313	B: reduced functional	B: reduced functional	No	Infilling taking place
bF	1.663	B: reduced functional	B: reduced functional	No	Infilling taking place
bG	0.359	NB: non-	NB: non- functional	No	

Table 6.3 High bog drainage detail

		functional			
bH	0.453	B: reduced functional	B: reduced functional	No	Infilling taking place
bJ	0.635	B: reduced functional	B: reduced functional	No	Infilling taking place
bK	1.047	B: reduced functional	B: reduced functional	No	Infilling taking place
bM	0.504	B: reduced functional	B: reduced functional	No	Water running towards high bog edge along its western section; Infilling taking place
bN	9.097	B: reduced functional	B: reduced functional	No	Infilling taking place
bN	9.160	B: reduced functional	B: reduced functional	No	Infilling taking place
bR	0.498	B: reduced functional	B: reduced functional	No	Infilling taking place
bS	0.314	B: reduced functional	B: reduced functional	No	Infilling taking place

#### Bog margin drainage

The cutover areas were not surveyed for drains during 2011.

South-east cutover drains were blocked as part of the restoration program. However, some cutover drains remain functional, as well as drains to the south of the high bog within reclaimed agriculture land. Therefore, some negative influence is still expected. These drains are considered to have a medium importance/impact on high bog habitats.

#### Fire history

No evidence of fire events having taken place in 2004 – 2011 period were noted in the 2011 survey. The last fire event recorded at the site took place before 1995.

#### Invasive species

Fernandez *et al.* (2005) mentioned *Rhododendron ponticum* along the western edge of the high bog boundary. A *Rhododendron ponticum* bush was also reported at the east of the high bog, between drains bF and bB. (GR 278821/208773). *Pinus sylvestris* seedlings and saplings were also found in the northern section of the high bog. Pines are also frequent within drain complex bQ to the south of drain bJ (up to 40 pine seedlings were reported within a small area of 50x50m).

The new 2011 survey confirmed the abundance of *Rhododendron ponticum*, which dominates the entire western and northern cutover, as well as the edge of the woodland on the northeastern ridge. Although some plants encroaching onto the high bog were recorded in the western section near Sc5 (GR 278740/207794) and some of high bog drains, the species does not seem to be a major threat to high bog habitats. Nonetheless, *Rhododendron ponticum* may pose a bigger threat to other habitats (e.g. Woodland) found within the SAC. The wetter conditions expected after the blocking of drains are not likely to benefit pine trees and thus its spread on the high bog will be hindered.

Invasive species are considered to have low intensity/impact on high bog habitats.

#### Other impacting activities

No other significant impacting activities were noted or recorded in 2011 impacting high bog habitats in the 2004-2011 reporting period.

#### **Conservation activities**

A Restoration Project was undertaken in 2003, which included the blocking of high bog drains and south-east cutover drains. Active Raised Bog and sub-marginal ecotope have expanded within some sections of high bog in the 2004-2011 reporting period.

Both high bog drainage blocking and the construction of dams on the cutover are reported as positive management actions under Restoring/Improving the hydrological regime (4.2) within table 6.1.

#### **Conservation status assessment**

The assessment of the conservation status of Annex I Active and Degraded Raised Bog 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 an increase (5.06ha) in the area of Active Raised Bog. Several new areas of sub-central ecotope (**Sc4** (2.08ha), **Sc8** (0.30ha), **Sc9** (0.34ha), **Sc10** (0.28ha), **Sc11** (0.14ha), **Sc12** (0.52ha), and **Sc13** (1.03ha)) have been mapped in 2011 (see Map 1). These are the result of re-wetting processes associated with the blocking of drains. Actual expansion of sub-central ecotope has also taken place along the northern section of **Sc6** (expanded by 0.17ha approx.) and the western section of **Sc7** (0.20ha approx.).

Large areas of what was termed Sc1, Sc2 and Sc3 in 2004 are now considered to be sub-marginal ecotope. However, these areas still support small pockets of sub-central ecotope, too small to map as polygons but depicted as dots on Map 2 (the sub-central ecotope complexes Map). Small patches of sub-central ecotope were also recorded adjacent to the current Sc7 and Sc8 as well as within the area of blocked drains bQ and bN. These patches were also considered too small to map as polygons but are also depicted as dots in Map 2

The active section within flush **Y** was wrongly mapped in 2004 on an area that consists of face bank ecotope. The actual location is to the east of the former location. Another smaller active flush section is still present to the northeast of the largest one. These active flush sections are slightly smaller than mapped in 2004. This is the result of a more comprehensive surveying and accurate mapping in 2011.

Former Sc2 mostly consisted of complex 9/7/10 (sub-central ecotope) in 2004. Almost all of the high bog sections where this complex was recorded have been re-allocated to sub-marginal ecotope and thus the largest portion of **Sc2** is now deemed sub-marginal ecotope. Only the north-western section of former **Sc2** is now considered to be sub-central ecotope (complex 9/7/10). Small pockets of complex 10/6 (sub-central ecotope) are also present along the south-western section of former Sc2. But these are too small to be mapped as part of a polygon and only dots were depicted on Map 2. The analysis of quadrat Qsm1 (former Qsc1) shows a slight variation in quadrat data (e.g. a slight decrease in *Sphagnum* cover 60% in 2004 to 34-50% in 2011). Thus, although the habitat losses are mostly attributed to discrepancies in vegetation interpretation, some drying out processes may have continued within Sc2.

Similarly to Sc2, former Sc3 is also much smaller than mapped in 2004, and only the southern section is now considered to correspond with sub-central ecotope. Complex 9/7/10 was recorded along the northern section and has been re-allocated to sub-marginal ecotope, whereas the southern section was mapped as 9/7+P (sub-central) and remains sub-central ecotope. As a result, **Sc3** is now much smaller than mapped in 2004 due to differences in vegetation interpretation rather than any real differences on the ground. A similar scenario has taken place at **Sc5** and **Sc6**, with sections re-allocated to sub-marginal ecotope. Quadrat Qsm2 (former Qsc2) analysis does not show major changes in the reporting period and *Sphagnum* cover for instance was already rather low (34-50%) for a sub-central community complex.

Complex 9/7/10 has been also re-allocated to sub-marginal ecotope at former Sc4 and Sc8 (only isolated patches recorded in 2011). As a result, these areas are no longer considered as sub-central ecotope.

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 130.21ha (based on 1994/5 Kelly (1995) figures amended by Fernandez *et al.* (2005), 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 (7.57ha) is 94.19% below the FRV. A current Area value more than 15% below FRV falls into the **Unfavourable Bad** assessment category.

Although a long term (17 years; 1992-2011) trend indicates a reduction (of 47.80ha) in the area of Active Raised Bog at the site (see table 8.1). A more recent and short term trend analysis (7 years; 2004-2011) gives a more optimistic result with a 5.06ha (200.79%) increase in Active Raised Bog. Therefore, the habitat Area is given an **Increasing** trend assessment.

The Area of Active Raised Bog at Ballykenny Bog is assessed as Unfavourable Bad-Increasing (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 3.79ha (half of 7.57ha, the current area of Active Raised Bog). The current value is 0.42ha which is 88.90% below the FRV. A current value more than 25% below FRV falls into the **Unfavourable Bad** assessment category.

Although a long term (17 years; 1992-2011) trend indicates a large reduction in the area of subcentral ecotope (reduction on habitat quality), which is also used as indicator of the habitat's quality (S&Fs) in the absence of central ecotope and the presence of a small active flush at the site (0.42ha) (see table 8.1). A more recent and short term trend analysis (7 years; 2004-2011) shows a considerable increase of sub-central ecotope and no change in active flush area. Therefore, considering the small portion of Active Raised Bog within the site a significant increase of subcentral ecotope should be taken as an indication of an **Improving** trend for the habitat's S&F.

Quadrats analysis (Qsm1, Qsm2 and Qsc3) indicates the following:

**Qsm1**: this quadrat was previously classified as sub-central ecotope (Qsc1; complex 9/7/10). Slight variation of quadrat data: a slight increase in hummocks and hollows cover, *Cladonia portentosa* and *Calluna vulgaris* cover; *Sphagnum fuscum* and *S. magellanicum* are now absent; a slight decrease in *S. capillifolium*, *Trichophorum germanicum* cover and overall *Sphagnum* cover.

**Qsm2**: this quadrat was previously classified as sub-central ecotope (Qsc2; complex 9/7/10). Slight variation of quadrat data: a slight increase in hummocks and hollows cover, *Trichophorum germanicum*, *Sphagnum capillifolium*, *Cladonia portentosa* and *Calluna vulgaris* cover; lawns and *Sphagnum magellanicum* are now absent; a slight decrease in *Sphagnum* hollows cover and *Rhynchospora alba* cover.

**Qsc3**: slight variation of quadrat data: algae hollows and pools, *Sphagnum* hollows are now absent; a slight increase in bare peat cover, hummocks cover and *Calluna vulgaris*; a slight decrease in hollows, *Sphagnum* pools cover, *Sphagnum austinii*, *S. cuspidatum* and *Cladonia portentosa* cover. The comparison indicates that quality (S&Fs) may have slightly declined, however this could be the result of lack of precision in relocating of the quadrat.

Some of the changes noted within the above quadrats may be also the result of lack of precision in relocating of the quadrat (up to 2m) between both year surveys, rather than actual changes.

Typical good quality indicators and typical plant species are still found in sub-central and central ecotopes throughout the entire bog. No major changes of their occurrence within quadrats have taken place (see Appendix III).

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

#### Future Prospects

Habitat Area has significantly increased and its S&Fs also slightly improved as a result of the blocking of drains. The most of the newly development or expanded ARB has taken place along the northern section of high bog. The north-east section, where sub-central patch **Sc13** has been reported is getting particularly wetter, which indicates that a big proportion of water on the high bog runs towards this section. Further expansion and new development of ARB is expected, particularly within the blocked drains sections. In addition, no major impacting activities threaten the habitat. Habitat **Area** is currently 94.19% below FRV (see table 8.4) and although an Increasing trend is expected in the following two reporting periods (12 years), the habitat Area is expected to remain more than 15% below FRV. Thus, habitat's **Area Future Prospects** are assessed as **Unfavourable Bad-Increasing**. Habitat's **S&Fs** are currently 88.90% below FRV (see table 8.4). An Improving trend is also foreseen, but the **S&Fs** are expected to be more than 25% below FRV in the following two reporting periods. Thus **S&Fs are selected** are assessed as **Unfavourable Bad-Increasing**. Habitat's **Future Prospects** are assessed as **Unfavourable Bad-Increasing** cutover functional drains is recommended. Cutover areas should be considered for restoration of the habitat in order to achieve FRVs.

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

Active	<b>1994/5</b> <sup>1</sup>	2004 <sup>2</sup>	2004	2011	Change (2004-2011)	
Ecotopes			(amended)			
	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	%
Sub-central	55.37	11.41	2.10	7.15	(+)5.06	(+)240.48
Active flush	n/a	0.75	0.42	0.42	0.00	0.00
Total	55.37	12.16	2.52	7.57	(+)5.06	(+)200.79

#### Table 8.1 Changes in Active Raised Bog area

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

<sup>2</sup> 2004 figures have been slightly modified based on a more accurately mapped High Bog boundary undertaken as part of this project. This has mostly affected face bank ecotope figures.

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 2011. The comparison between 2004 (amended) and 2011 illustrates the actual changes in ecotope area in the 2004-2011 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 2011 (see table 8.2 for further detail).

Area	Quadrats	Trend	Comment Quadrats analysis			
Sc1	None	Stable	Smaller than mapped in 2004. This			
			change is the result of more			
			comprehensive surveying in 2011 which			
			resulted in more accurate mapping. In			
			addition, some isolated patches of sub-			
			central ecotope (too small to be mapped)			
			were also recorded within former Sc1.			
Sc2	None	Stable	Smaller than mapped in 2004. These			
		(possibly	changes are due to re-allocation of			
		declining)	previously mapped sub-central			
			vegetation to sub-marginal ecotope.			
			Nonetheless, Qsm1 (former Qsc1)			
			analysis shows some slight changes (e.g.			
			slight decrease in Sphagnum cover) and			

Table 8.2 Assessment of changes in individual Active Raised Bog areas

			thus drying out may have continued	
			within Sc2.	
Sc3	Qsc3	Stable	Smaller than mapped in 2004. These	Qsc3: algae hollows and pools,
			changes are due to re-allocation of	Sphagnum hollows now absent; slight
			previously mapped sub-central	increase in bare peat cover, hummocks
			vegetation to sub-marginal ecotope.	cover and Calluna vulgaris; slight
				decrease in hollows, Sphagnum pools
				cover, Sphagnum austinii, S. cuspidatum
				and Cladonia portentosa cover.
Sc4	None	Newly	This sub-central ecotope section has	
		developed	developed as a result of re-wetting	
			associated with the blocking of drains.	
Sc5	None	Stable	Slightly smaller than mapped in 2004.	
			This change is the result of more	
			comprehensive surveying in 2011 which	
			resulted in more accurate mapping.	
			Northern section has been re-allocated to	
			sub-marginal ecotope.	
Sc6	None	Increasing	Slight changes in boundary. This change	
			is the result of more comprehensive	
			surveying in 2011 which resulted in more	
			accurate mapping. Part of this more	
			intensive survey resulted in the re-	
			allocation of some areas previously	
			mapped as sub-central to sub-marginal	
			ecotope. In other areas Sub-central was	
			recorded as expanding as a result of	
			drain blocking.	
Sc7	None	Increasing	Slight changes in boundary. This change	
			is the result of more comprehensive	
			surveying in 2011 which resulted in more	
			accurate mapping. Part of this more	
			intensive survey resulted in the re-	
			allocation of some areas previously	
			mapped as sub-central to sub-marginal	
			ecotope. In other areas Sub-central was	

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			recorded as expanding as a result of
			drain blocking.
Sc8	None	Newly	This sub-central ecotope section has
		developed	developed as a result of re-wetting
			associated with the blocking of drains.
Sc9	None	Newly	This sub-central ecotope section has
		developed	developed as a result of re-wetting
			associated with the blocking of drains.
Sc10	None	Newly	This sub-central ecotope section has
		developed	developed as a result of re-wetting
			associated with the blocking of drains.
Sc11	None	Newly	This sub-central ecotope section has
		developed	developed as a result of re-wetting
			associated with the blocking of drains.
Sc12	None	Newly	This sub-central ecotope section has
		developed	developed as a result of re-wetting
			associated with the blocking of drains.
Sc13	None	Newly	This sub-central ecotope section has
		developed	developed as a result of re-wetting
			associated with the blocking of drains.
FY	None	Stable	Active sections of FY slightly smaller
			than mapped in 2004. This change is the
			result of more comprehensive surveying
			in 2011 which resulted in more accurate
			mapping.

#### Degraded Raised Bog (7120)

#### Area

The Degraded Raised Bog FRV for Area is 50.60ha at Ballykenny Bog. This value corresponds with the difference between the current high bog area (180.81ha) and Active Raised Bog FRV (130.21ha) 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 242.37% bigger than FRV and therefore the habitat Area is given an **Unfavourable Bad** assessment (see table 8.4).

The 2011 survey recorded marginal ecotope patches within sub-marginal ecotope, particularly between **Sc2**, **Sc7** and **Sc10**. However, these patches were not mapped as polygons in Map 1, but merely depicted as dots in Map 2. A more comprehensive survey focused on these ecotope types would probably result in some marginal patches being mapped within sub-marginal on Map1.

Table 8.3 indicates that there has been a decrease (5.06ha) in the area of Degraded Raised Bog. The decrease is the result of expansion of Active Raised Bog (see table 8.2). Therefore the habitat is given a **Decreasing** trend due to the decrease of its area. However, this should be taken as positive.

The Area of Degraded Raised Bog at Ballykenny 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 43.31ha (25% of 173.24ha, the current area of Degraded Raised Bog). The current marginal and face bank ecotopes area value (16.18ha) is 62.64% below 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 below FRV falls into the **Favourable** 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). As table 8.3 indicates, marginal ecotope has decreased by 25.44ha due to an improvement to sub-marginal ecotope. This process has taken place mostly along the entire northern section of high bog and also along the southern boundary of the large central flush Y. In addition another approx. 5.06 ha of sub-marginal improved to sub-central. The 0.95ha of face bank mapped incorrectly as active flush on the 2004 map were already present in 2004 and therefore, this change should not be taken as a change in face bank area. Thus, the DRB's S&Fs at Ballykenny Bog are given an **Improving** trend.

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 Ballykenny Bog are assessed as Favourable-Improving (see table 8.5).

#### Future Prospects

No major impacting activities seem to threaten Degraded Raised Bog at Ballykenny Bog. Further expansion and development of Active Raised Bog and rewetting of Degraded Raised bog is expected, particularly within blocked drains sections. Habitat **Area** is currently 242.37% above FRV (see table 8.4) and a Decreasing trend is expected in the following two reporting periods (12 years) as a result of expansion of Active Raised Bog. Nevertheless 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 62.64% below FRV (see table 8.4). An Improving trend is foreseen in the following two reporting periods, **S&Fs** are expected to remain below FRV. Thus, habitat's **S&Fs Future Prospects** are assessed as **Favourable-Improving**.

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

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

Inactive Ecotopes	<b>1994/5</b> <sup>1</sup>	2004 <sup>2</sup>	2004 (amended)	2011	Change (2	004-2011)
	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	%
Sub- marginal	74.84	118.76	132.36	152.74	(-)20.38	(-)15.40
Marginal	47.73	32.32	28.33	2.89	(-)25.44	(-)89.80
Face bank	n/a	12.34	13.29	13.29	0.00	0.00
Inactive flush	5.15	5.23	4.32	4.32	0.00	0.00
Total	127.72	168.65	178.3	173.24	(-)5.06	(-)2.84

Table 8.3 Changes in Degraded Raised Bog area

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

<sup>2</sup> 2004 figures have been slightly modified based on a more accurately mapped High Bog boundary undertaken as part of this project. This has mostly affected face bank ecotope figures.

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 2011. The comparison between 2004

(amended) and 2011 illustrates the actual changes in ecotope area in the 2004-2011 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 2011.

#### 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 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 both Active Raised Bog and sub-marginal ecotope has increased in the reporting period. As result habitat Area is given an **Increasing** 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. The habitat is not under significant threat from impacting activities and thus further increases and expected. Therefore, the habitat's Area Future Prospects are given an **Unfavourable Bad-Increasing** 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-Improving** 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-Improving** assessment.

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

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

Habitat	Area Assessment			Structure & Functions Assessment		
	FRV Target (ha) 1	2011 value (ha) <sup>2</sup>	% below target	FRV 2011 Target (ha) <sup>3</sup>	2011 value (ha) 4	% below target
7110	130.21	7.57	94.19	3.79	0.42	88.90

Table 8.4 Habitats favourable reference values

<sup>1</sup>1992 central, sub-central, active flush, bog woodland and sub-marginal ecotope area.

<sup>2</sup> 2011 central, sub-central ecotope, active flush and bog woodland area.

<sup>3</sup> 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.

<sup>4</sup>2011 central ecotope and active flush area.

	FRV Target	2011 value	% above	FRV 2011	2011 value	% above
	(ha) <sup>5</sup>	(ha) <sup>6</sup>	target	Target (ha) <sup>7</sup>	(ha) <sup>8</sup>	target
7120	50.60	173.24	242.37	43.31	16.18	62.64

<sup>5</sup> 1992 high bog area minus 7110 area FRV.

<sup>6</sup> 2011 Degraded Raised Bog area.

<sup>7</sup> 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.

<sup>8</sup>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–Improving.
- **Degraded Raised Bog is assessed as being Unfavourable Bad–Improving**. Despite the decrease of habitat area, this is the result of increase of Active Raised Bog, and is taken as positive.
  - Rhynchosporion depressions is assessed as being Unfavourable Bad-Improving.

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Habitat	Area Assessment	Structure & Functions	Future Prospects Assessment	Overall Assessment

Table 8.5 Habitats conservation status assessments

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		Assessment		
7110	Unfavourable	Unfavourable Bad-	Unfavourable Bad-	Unfavourable Bad-
	Bad-Increasing	Improving	Improving	Improving
7120	Unfavourable	Favourable-	Unfavourable Bad-	Unfavourable Bad-
	Bad-Decreasing	Improving	Improving	Improving
7150	Unfavourable	Unfavourable Bad-	Unfavourable Bad-	Unfavourable Bad-
	Bad-Increasing	Improving	Improving	Improving

#### Conclusions

#### Summary of impacting activities

There have been no major changes in the intensity or influence of impacting activities:

- Peat cutting is no longer present at the site. However, open face banks may still continue to drain the high bog.
- Only reduced functional drains remain on the high bog. These include those that have been blocked, as they are still considered to have some negative influence on high bog habitats and will continue to do so until they have become completely in-filled. Overall high bog drains have continued infilling.
- Cutover drainage and reclaimed agriculture land drainage (peripheral drainage) continue to have some negative influence on high bog vegetation.
- No fire events have damaged the high bog in the reporting period.
- *Pinus sylvestris* and *Rhododendron ponticum* although present across many sections of high bog do not seem to have spread in the reporting period and are not considered a major threat.

#### Changes in active peat forming areas

 Seven new areas of sub-central ecotope (Sc4, Sc8, Sc9, Sc10, Sc11, Sc12 and Sc13) have developed in the reporting period 2004-2011. These are the result of re-wetting processes associated with the blocking of drains. Expansion of sub-central ecotope has also taken place along the northern section of Sc6 and the western section of Sc7.

- The active section within **flush Y** was wrongly mapped in 2004 in an area that consists of face bank ecotope. The actual location is to the east of the formerly depicted location.
- Many sections of formerly recorded sub-central ecotope complex 9/7/10 have been reallocated to sub-marginal (Sc2, Sc3, Sc5 and Sc6). This is the result of vegetation reinterpretation rather than actual changes. Nonetheless, quadrat analysis indicates slight changes within Sc2 (Qsm1), and although the habitat losses are mostly attributed to discrepancies in vegetation interpretation, some drying out processes may have continued within Sc2.

#### Other changes

· Sub-marginal ecotope has expanded within blocked drains sections.

#### Quadrats analysis

- No major changes in vegetation have taken place within those quadrats recorded in 2004 that were re-surveyed in 2011 (see Appendix III). Two quadrats: Qsm1 and Qsm2 previously classified as sub-central are now deemed sub-marginal. However, the vegetation recorded within these quadrats in 2004 has been re-interpreted as being sub-marginal ecotope. Nevertheless slight changes have taken place within Qsm1 indicating that there may have been a slight decline in habitat quality here.
- Although high accuracy GPS equipment was used during the 2004 and 2011 surveys, the devises still only allow up to 0.5m accuracy. The lack of precision in relocating of the quadrat may justify certain differences in the vegetation described. Permanent markers were inserted into quadrats recorded in 2011.

#### **Restoration works**

 Restoration works (blocking of high bog and cutover drains) was undertaken in 2003. Infilling processes has continued in the blocked drains and rewetting has triggered the formation of new Active Raised Bog sections (Sc4, Sc8, Sc9, Sc10, Sc11, Sc12 and Sc13), as well as the expansion of Sc6 and Sc7, and the expansion of sub-marginal ecotope in several locations.

#### Summary of conservation status

• Active Raised Bog has been given an overall Unfavourable Bad-Improving conservation status at Ballykenny Bog. Habitat Area has increased and quality (S&Fs) improved in the

reporting period. However both values are below the FRVs. Future Prospects are considered Unfavourable Bad-Improving.

- Degraded Raised Bog has been given an overall Unfavourable Bad-Improving conservation status at Ballykenny Bog. Habitat Area has slightly decreased due to an increase of Active raised Bog and the quality (S&Fs) has improved in the reporting period. Habitat Area is above the FRV, which is deemed negative as regards the habitat Area status. Future Prospects are considered Unfavourable Bad-Improving due to further improvements expected associated with the blocking of drains.
- Depressions on peat substrates of the Rhynchosporion has been given an overall Unfavourable Bad-Improving conservation status at Ballykenny Bog. Habitat Area and quality (S&Fs) are considered to have increased and improved in the reporting period. Future Prospects are considered Unfavourable Bad-Improving.

The conservation status of the **overall raised bog** at **Ballykenny SAC** is assessed as being **Unfavourable Bad-Improving**.

#### Recommendations

- Further restoration works including the blocking of any remaining cutover functional drains.
- **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.
- **Further botanical monitoring surveys** both on the high bog and cutover in order to assess the effectiveness of restoration works.

#### References

Cross, J. R. 1990. *The Raised Bogs of Ireland: their Ecology, Status and Conservation*. Report to the Minister of State at the Department of Finance.

Fernandez, F., Fanning, M., McCorry, M. and Crowley, W. 2005. *Raised Bog Monitoring Project 2004-*05. Unpublished report, National Parks & Wildlife Service, Department of Environment, Heritage and Local Government, Dublin. Kelly, L., Doak, M. and Dromey, M. 1995. *Raised Bog Restoration Project: An Investigation into the Conservation and Restoration of Selected Raised Bog Sites in Ireland*. Unpublished report, National Parks & Wildlife, Department of Environment, Heritage and Local Government, Dublin.

Kelly, L. & Schouten, M.G.C. (2002) Vegetation. In: M. G. C. Schouten (Ed.), *Conservation and Restoration of Raised Bogs: Geological, Hydrological and Ecological Studies*, pp.110-169, Department of Environment and Local Government, Dublin, Ireland/Staatabosbeheer, The Netherlands.

#### Appendix I Detailed vegetation description of the high bog

#### Active Raised Bog (7110)

#### Sub-Central Ecotope Complexes

#### COMPLEX 10/9

- Location: this complex dominates newly formed Sc4 and also Sc9.
- · Ground: very soft
- Physical indicators: absent
- Calluna height: 10-20cm
- Cladonia cover: <4%
- Macro-topography: depression
- **Pools**: regular pools (34-50%)
- Sphagnum cover: 75-90%
- *Narthecium* cover: <4%
- Micro- topography: Low hummocks/lawns/pools/Eriophorum vaginatum tussocks
- **Tussocks**: Eriophorum vaginatum (34-50%)
- Degradation or regeneration evidence: area between blocked drains bB (GR 208611/278528) rewetting
- Species cover: Calluna vulgaris (4-10%), Erica tetralix (<4%), Eriophorum vaginatum (34-50%), E. angustifolium (<4%), Narthecium ossifragum (<4%), Rhynchospora alba (<4%), Andromeda polifolia (<1%), Drosera rotundifolia (<1%), Sphagnum capillifolium (Hummocks (H); 4-10%), S. papillosum (H; 4-10%), S. cuspidatum (Pools (P) & Lawns (L); 50-75%), S. magellanicum (L; <4%).</li>
- Additional comments: area Sc4 has developed adjacent and between blocked drains bB. Narrower sections adjacent to drains have lower *S. cuspidatum* cover and higher *S. capillifolium*, *S. magellanicum*, *S, austinii* hummocks cover, as well as *E. angustifolium* cover. *N. ossifragum* and *Trichophorum germanicum* cover also increases on these areas. Sub-central ecotope within drains is generally waterlogged and contain open water and high *S. cuspidatum* cover.

Within **Sc9** pools are lawn-like type and cover 11-to 25%. *Sphagnum* cover is 51 to 75% and micro-topography consists of high hummocks/hollows and pools.

#### COMPLEX 10/6

- Location: this complex is located to the south of Sc2; only sub-central ecotope dots were depicted on Map 2 as this sub-central ecotope consists of small scattered patches, therefore too small to be mapped as a polygon
- · Ground: soft
- · Physical indicators: absent
- · Calluna height: 11-20cm
- Cladonia cover: 4-10%
- Macro-topography: flat (possibly a depression)
- · Pools: absent
- *Sphagnum* cover: 34-50% (51-75% in places)
- *Narthecium* cover: 26-33%
- · Micro- topography: High hummocks/hollows
- **Tussocks**: Eriophorum vaginatum (11-25%)
- · Degradation or regeneration evidence: absent
- Species cover: Calluna vulgaris (11-25%), Erica tetralix (4-10%), Eriophorum vaginatum (11-25%),
  E. angustifolium (4-10%), Narthecium ossifragum (26-33%), Rhynchospora alba (4-10%), Andromeda polifolia (<4%), Trichophorum germanicum (<4%), Racomitrium lanuginosum (<4%), Sphagnum capillifolium (H; 11-25%), S. papillosum (H & Hollows (Hl); 4-10%), S. tenellum (H; 4-10%), S. fuscum (H; <4%), S. austinii (H; <4%), S. magellanicum (H & L; 4-10%), S. cuspidatum (Hl; <4%).</li>
- Additional comments: This complex grades into the sub-marginal complex 9/7/6 and occurs in mosaic with it in places. The sub-marginal areas have little or no *Sphagnum* cover in the *Narthecium ossifragum* depressions while the sub-central areas have a cover (though sometimes patchy cover) of *Sphagnum* particularly *S. magellanicum* in these depressions.

#### COMPLEX 9/10

- Location: this is the most widespread sub-central ecotope complex at the site and dominatesSc1, Sc6, Sc8, Sc10, Sc11, Sc12 and Sc13. It is also found in scattered isolated subcentral ecotope patches across the high bog
- · Ground: very soft
- Physical indicators: absent
- · Calluna height: 20-30cm
- Cladonia cover: <4%
- · Macro-topography: depression

- Pools: absent
- Sphagnum cover: 50-75%
- *Narthecium* cover: <4%
- · Micro- topography: High hummocks/hollows
- **Tussocks**: *Trichophorum germanicum* (<4%)
- **Degradation or regeneration evidence**: **Sc8** area located between blocked drains is likely to be rewetting
- Species cover: Calluna vulgaris (4-10%), Erica tetralix (4-10%), Eriophorum vaginatum (26-33%), E. angustifolium (<4%), Narthecium ossifragum (<4%), Rhynchospora alba (<4%), Trichophorum germanicum (<4%), Andromeda polifolia (<1%), Drosera rotundifolia (<1%), Sphagnum capillifolium (H; 11-25%), S. papillosum (H; 4-10%), S. tenellum (H;<4%), S. cuspidatum (HI; 11-25%).</li>

Additional comments: Sc6 also contains some patches of sub-marginal complex 9/7.

Complex 9/10 was also recorded within **Sc1**. This sub-central ecotope complex is also found immediately west **Sc12** (GR 209000/279574) and *Sphagnum capillifolium* hummocks, *Eriophorum vaginatum* and *E. angustifolium* dominate the complex which also features *Sphagnum papillosum*, *S. austinii* hummocks. Overall 76 to 90% *Sphagnum* cover. Areas where peat was extracted to build dams also contain *Sphagnum cuspidatum* and *Rhynchospora alba*.

A new large area of sub-central ecotope (**Sc13**) was recorded to the northeast of the woodland (GR 209288/279384). Here complex 9/10 consists of dominant *Eriophorum vaginatum* (76-90%) along with abundant *Sphagnum capillifolium, S. fallax, S. magellanicum* in hummocks and *S. cuspidatum* in hollows (34-50%). The areas is waterlogged and overall *Sphagnum* cover is high (76-90%). **Sc13** also features patches dominated by *Eriophorum angustifolium* and contain flush like species such as *Aulacomnium palustre*. This sub-central ecotope area is surrounded by complex 9/7 also very wet and with abundant *Eriophorum vaginatum*, but lower *Sphagnum* cover. Tall, robust *Calluna vulgaris*, scattered *Pinus sylvestris* and *Rhododendron ponticum* bushes were noted in some areas adjacent to drains within **Sc13**, where ground is drier.

#### COMPLEX 9/7/10

- Location: this complex is found in many of the sub-central ecotope sections on the site (Sc1, Sc2, Sc3, Sc5, Sc6, Sc7, Sc11 and Sc12)
- Ground: soft
- Physical indicators: absent
- · Calluna height: 20-30cm
- *Cladonia* cover: variable (up to 75% in places)

- Macro-topography: depression
- Pools: absent
- Sphagnum cover: 51-75%
- Narthecium cover: absent
- Micro- topography: Low hummocks/ Eriophorum vaginatum tussocks
- **Tussocks**: Eriophorum vaginatum (50-75%)
- Degradation or regeneration evidence: absent
- Species cover: Calluna vulgaris (<4%), Erica tetralix (4-10%), Eriophorum vaginatum (50-75%), E. angustifolium (<4%), Andromeda polifolia (<1%), Vaccinium oxycoccos (<1%), V. myrtillus (<1%), Rhododendron ponticum (<1%), Sphagnum capillifolium (H; 35-50%), S. papillosum (H; <4%), S. austinii (H; <1%).</li>
- Additional comments: Sc5 has some flush type species such as *Vaccinium oxycoccos* and *V. myrtillus*.

Complex 9/7/10, consisting of *Sphagnum capillifolium* hummocks along with abundant *Eriophorum vaginatum* and *Calluna vulgaris*, was also recorded within formerly sub-central section **Sc6**. However, currently only small patches of 9/7/10 are present within former **Sc6**. These are too small to be mapped and overall this section is considered to be sub-marginal ecotope.

This complex is gain found to the south east of **Qsc3** within **Sc3**. Here the complex has flush type species including *Empetrum nigrum*, *Polytrichum strictum* and *Vaccinium oxycoccos*. *Pleurozium schreberi* and *Dicranum scoparium* also recorded.

This complex dominates **Sc7**. This sub-central section is characterised by high *Sphagnum capillifolium* cover (51-75%), abundant *Eriophorum vaginatum* and *Calluna vulgaris*. Some flush type species such as *Aulacomnium palustre* and *Vaccinium oxycoccos* were also recorded. This area is likely to have expanded after the blocking of drains. Where peat was extracted pools with open water and *Sphagnum cuspidatum* has developed. Overall *Sphagnum* cover within these localized higher wetter sections is 51 to 75%. *Narthecium ossifragum* cover is slightly higher (4-10%) in some areas compared to the surrounding vegetation.

Complex 9/7/10 dominates a small section of sub-central ecotope within **Sc2**. Here, complex 9/7/10 mostly consists of abundant *Sphagnum capillifolium* hummocks, *Eriophorum vaginatum* and *Calluna vulgaris*. Blocked drains are in-filled with open water, *Sphagnum cuspidatum* and *S. papillosum*. **Sc2** is located on a depression on the ground. The southeast section of **Sc2** contains *S. papillosum*, *S. austinii* hummocks and *Eriophorum angustifolium*. Overall 51 to 75% *Sphagnum* 

cover. *Narthecium ossifragum* cover 4 to 10% in places. Flush type species also noted with **Sc2** (*Vaccinium oxycoccos* and *Polytrichum strictum*).

Complex 9/7/10 was recorded in many areas between the blocked drains. However, many of them area too small to be mapped and are associated with areas where peat was extracted to build dams.

A new sub-central ecotope section (Sc11) was noted to the northwest of high bog (GR 208587/279839). Complex 9/7/10 is characterised by a thin *Sphagnum* layer at this location consisting of *S. capillifolium, S. tenellum* with frequent *Eriophorum vaginatum, Rhynchospora alba* and *Calluna vulgaris. Cladonia portentosa* cover is relatively high (34-50%). *Sphagnum cuspidatum* was noted in those areas where peat was extracted to build dams. Overall 51 to 75% *Sphagnum* cover.

#### COMPLEX 9/7+P

- Location: this complex is only found within Sc3
- Ground: soft to very soft
- · Physical indicators: absent
- · Calluna height: 20-30cm
- Cladonia cover: 4-10%
- · Macro-topography: depression
- **Pools**: regular (11-25%)
- Sphagnum cover: 51-75%
- *Narthecium* cover: <4%
- · Micro- topography: High and low hummocks/lawns/pools/hollows
- **Tussocks**: Eriophorum vaginatum (<4%)
- · Degradation or regeneration evidence: absent
- Species cover: Calluna vulgaris (34-50%), Erica tetralix (4-10%), Eriophorum angustifolium (11-25%), E. vaginatum (4-10%), Narthecium ossifragum (<4%), Vaccinium oxycoccos (<1%), Andromeda polifolia (<1%), Menyanthes trifoliate (<1%), Drosera anglica (<1%), Sphagnum capillifolium (H; <4%), S. magellanicum (H & L; 26-33%), S. papillosum (H & L; 11-25%), S. tenellum (H; <4%), S. fuscum (H; <1%), S. austinii (H; <1%), S. cuspidatum (HI & P; <4%), Dicranum scoparium (<1%).</li>
- · Additional comments: none

Quadrat Qsc3 was recorded within this complex at Sc3.

Active Flushes

#### FLUSH Y

Although this flush is mostly inactive, it also features a very wet and waterlogged section deemed active peat forming. Some of the inactive sections consist of very similar vegetation to that described for sub-marginal complex 9/7, but with abundant *Myrica gale* and some other flush type species such as *Polytrichum strictum*, *Aulacomnium palustre*, *Vaccinium oxycoccos* and *Dicranum scoparium*. Southern section of flush Y was likely to be cutover in the past.

Active peat forming section features high *Sphagnum* cover (*S. magellanicum, S. capillifolium, S. palustre, S. fallax* and *S. cuspidatum*). *Molinia caerulea* was noted closer to the drain that runs along the center of flush Y.

Western section of flush Y is inactive. Although the drain running through the center of the flush was also blocked, water was noted running towards to west of high bog. Many scattered trees (*Pinus sylvestris* and *Betula pubescens*) are present across the middle section of the flush on the raised driest sections adjacent to drain.

#### Degraded Raised Bog (7120)

#### Sub-Marginal Ecotope Complexes

#### COMPLEX 9/7

- **Location**: this complex is found across entire high bog but mainly adjacent to sub-central ecotope sections and dominating the northern lobe above flush Y
- · Ground: soft
- **Physical indicators**: bare peat <4%
- Calluna height: 30-40cm
- Cladonia cover: variable (up to 33% in places)
- Macro-topography: gentle slope
- Pools: absent
- Sphagnum cover: 11-25%
- *Narthecium* cover: <4%
- Micro- topography: Low hummocks/hollows
- **Tussocks**: *Trichophorum germanicum* (<4%)
- Degradation or regeneration evidence: absent

- Species cover: Calluna vulgaris (34-50%), Erica tetralix (4-10%), Eriophorum vaginatum (11-25%),
  E. angustifolium (<4%), Narthecium ossifragum (<4%), Trichophorum germanicum (<4%),</li>
  Rhynchospora alba (<4%), Andromeda polifolia (<1%), Drosera rotundifolia (<1%), Sphagnum capillifolium (H; 11-25%), S. papillosum (H; <4%), S. tenellum (H; <4%), S. fuscum (H; <1%), S. austinii (H; <1%), S. cuspidatum (HI; <4%), Hypnum jutlandicum (<1%)</li>
- Additional comments: Previously (2004) mapped Sc4 sub-central ecotope now mostly corresponds with complex 9/7(sub-marginal ecotope). Some sections within former Sc4 are borderline sub-marginal/Sub-central ecotope, with an overall *Sphagnum* cover between 26 and 33%, particularly where *Eriophorum angustifolium* cover increases.

Complex 9/7 is also found within an area previously mapped as marginal ecotope to the north of **Qsc3** (GR 208707/278746). Here scattered *Pinus sylvestris* trees (up to 3m) were found clustered in two groups. The northeast cluster has many seedlings.

Complex 9/7 also recorded within blocked drains to the west of previously named **Sc7**. Here vegetation consists of abundant *Eriophorum vaginatum* (76-90%). *Calluna vulgaris* (4-10%) and *Sphagnum capillifolium* (11-25%).Overall *Sphagnum* cover 26-33%.

This complex was frequently recorded along the northern section of high bog, to the north of flush Y. Here vegetation consists of *Eriophorum vaginatum* (76-90%), *E. angustifolium* (<4%), *Calluna vulgaris* (4-10%). Overall *Sphagnum* cover is 11 to 25%, mostly *S. capillifolium, S. tenellum* and *S. papillosum*. Scattered *Pinus sylvestris* trees (up to 3m) were also found.

Quadrat Qsm1 (former Qsc1) and Qsm2 (former Qsc2) were recorded within this complex.

#### COMPLEX 9/7/6

- **Location:** this is the most widespread sub-marginal ecotope complex at the site and it dominates the middle and westerns sections of high bog
- Ground: firm
- **Physical indicators**: bare peat <4%
- Calluna height: 20-30cm
- Cladonia cover: 11-25%
- Macro-topography: gentle slope
- Pools: absent
- Sphagnum cover: 11-25%
- Narthecium cover: 11-25%
- · Micro- topography: low hummocks/hollows
- **Tussocks**: Eriophorum vaginatum (4-10%)

- · Degradation or regeneration evidence: absent
- Species cover: Calluna vulgaris (11-25%), Erica tetralix (4-10%), Eriophorum vaginatum (11-25%),
  E. angustifolium (<4%), Narthecium ossifragum (4-10%), Carex panicea (<4%), Andromeda polifolia (<1%), Drosera rotundifolia (<1%), Sphagnum capillifolium (H; 4-10%), S. papillosum (H; <4%), S. tenellum (H; <4%), S. subnitens (H; <4%), Leucobryum glaucum (<1%), Racomitrium lanuginosum (<1%)</li>
- Additional comments: Complex 9/7/6/ becomes 9/7/6+P where scattered pools are found. Pools are regular in shape and small, thus some could be considered hollows. They consist of open water with small amount of *Sphagnum cuspidatum* and *S. capillifolium, S. magellanicum, S. papillosum, S. fuscum* adjacent to the pools. *Racomitrium lanuginosum* was also recorded.
  Complex 9/7/6 also dominates large areas within blocked drains to the west of previously named Sc7. Sub-central ecotope (complex 9/7/10) was also noted within this section, but these

areas are too small to be mapped. High *Sphagnum* cover was also noted where peat was dug out to build dams.

#### COMPLEX 7/6

- Location: this complex is found to south of FY, mostly between Sc2 and Sc10
- Ground: firm to soft
- **Physical indicators**: bare peat <4%
- · Calluna height: 21-30cm
- Cladonia cover: <4%
- Macro-topography: gentle slope
- Pools: absent
- Sphagnum cover: 11-25%
- Narthecium cover: 26-33%
- Micro- topography: low hummocks/Narthecium ossifragum flats/hollows
- Tussocks: absent
- Degradation or regeneration evidence: absent
- Species cover: Calluna vulgaris (11-25%), Erica tetralix (4-10%), Eriophorum vaginatum (<4%), E. angustifolium (<4%), Narthecium ossifragum (26-33%), Carex panicea (<1%), Trichophorum germanicum (<1%), Andromeda polifolia (<1%), Sphagnum capillifolium (H; 4-10%), S. papillosum (H; <4%), S. tenellum (H; <4%), S. subnitens (H; <4%), S. fuscum (H:<1%), Leucobryum glaucum (<1%), Racomitrium lanuginosum (<1%), Pleurozia purpurea (<1%).</li>

• Additional comments: some sections within this sub-marginal ecotope correspond with marginal ecotope (6/7).

Marginal Ecotope Complexes

#### COMPLEX 6/7

- Location: this complex is found in two different locations to the south and east of high bog
- Ground: firm
- **Physical indicators**: bare peat (<4%)
- · Calluna height: 20-30cm
- Cladonia cover: 4-10%
- Macro-topography: gentle slope
- Pools: absent
- Sphagnum cover: 4-10%
- Narthecium cover: 26-33%
- · Micro- topography: low hummocks/hollows
- **Tussocks**: Eriophorum vaginatum (<4%)
- · Degradation or regeneration evidence: absent
- Species cover: Calluna vulgaris (26-33%), Erica tetralix (<4%), Eriophorum vaginatum (<4%), E. angustifolium (<4%), Narthecium ossifragum (26-33%), Sphagnum capillifolium (H; <4%), S. tenellum (H; <4%), S. subnitens (H; <4%), S. fuscum (H; <1%), S. papillosum (H; <4%).</li>
- · Additional comments: none

#### COMPLEX 7/2

- Location: this complex is found on the marginal ecotope section to the northwest of high bog
- · Ground: firm
- Physical indicators: absent
- · Calluna height: 31-40cm
- Cladonia cover: 4-10%
- · Macro-topography: steep slope
- Pools: absent
- Sphagnum cover: 4-10%
- Narthecium cover: 4-10%
- · Micro- topography: High and low hummocks/hollows

- Tussocks: absent
- · Degradation or regeneration evidence: absent
- Species cover: Calluna vulgaris (34-50%), Erica tetralix (4-10%), Eriophorum vaginatum (<4%), %),</li>
  E. angustifolium (<4%), Narthecium ossifragum (4-10%), Trichophorum germanicum (4-10%),</li>
  Rhynchospora alba (4-10%), Sphagnum capillifolium (H; 4-10%), S. papillosum (H; <4%), S. tenellum (H; <4%).</li>
- Additional comments: *Rhynchospora alba* increases in places (11-25%) occurring largely in depressions.

Face bank Complexes

#### COMPLEX 1

- Location: this complex was found along the bog margin
- · Ground: firm
- **Physical indicators**: bare peat variable (4-10%)
- Calluna height: <50cm
- *Cladonia* cover: variable up to 33%
- Macro-topography: steep slope
- Pools: absent
- *Sphagnum* cover: generally absent but <4% in places
- *Narthecium* cover: <4%
- Micro- topography: tall robust Calluna vulgaris
- **Tussocks:** *Trichophorum germanicum* (<4%)
- · Degradation or regeneration evidence: absent
- Species cover: Calluna vulgaris (76-90%), Erica tetralix (4-10%), Trichophorum germanicum (<4%), Sphagnum capillifolium (H; <4%), S. tenellum (H; <4%), S. subnitens (H; <4%), Hypnum jutlandicum (<4%).</li>
- Additional comments: face bank ecotope also dominates an area to the south of flush Y. This areas was wrongly mapped as active flush in 2004, whereas as flush is actually located slightly to the east of this section. This face bank area is likely to be on top of a mineral mound.

Inactive Flushes

#### FLUSH Y

A description of the inactive sections of flush Y is given above within flush Y description provided within Active Raised Bog.

#### Depressions on peat substrates of the Rhynchosporion (7150)

The habitat occurs at Ballykenny Bog in both Active and Degraded Raised Bog. Only *Rhynchospora alba* was recorded within the 2011 survey at this site.

*R. alba* is found in all ecotopes except the face bank in Ballykenny Bog, such as: sub-central ecotope (10/9; 10/6; 9/10 and 9/7/10); sub-marginal ecotope (9/7) and marginal ecotope (7/2).

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. *R. alba* was also recorded in more degraded areas such as erosion channels and depressions within marginal ecotope. In fact *R. alba* becomes very frequent in depressions within complex 7/2 (marginal); complex that covers a small area in the northwest high bog section.

## Appendix II Photographical records

Photograph Number	Aspect	Туре	Feature	Date
102-0508	SW	Overview	Qsc3	10/10/2011
102-0509	NE	Overview	Qsm2	10/10/2011
102-0510	E	Overview	Qsm1	10/10/2011

## Appendix III Quadrats

Ecotope type	Sub-central	Sub-marginal	Sub-central	Sub-marginal
Complex Name	9/7/10	9/7	9/7/10	9/7
Quadrat Name	Qsc1	Qsm1	Qsc2	Qsm2
Easting	208960	208970	208778	208783
Northing	279063	279065	278853	278859
Firmness	Firm-soft	Soft	Very soft	Soft
Burnt	No	No	No	No
Algae in hollows %	Absent	Absent	4-10	Absent
Algae in pools %	Absent	Absent	Absent	Absent
Bare peat %	Absent	Absent	Absent	Absent
High hummocks %	na	Absent	Na	Absent
Low hummocks %	34-50	51-75	34-50	51-75
Hollows %	4-10	11-25	11-25	26-33
Lawns %	Absent	Absent	4-10	Absent
Pools %	Absent	Absent	Absent	Absent
Pool type	Absent	Absent	Absent	Absent
S.austinii hum type	na	Relic	Absent	Absent
S.austinii hum %	1-3 (many indiv)	1-3 (many indiv)	Absent	Absent
S.austinii height(cm)	na	0-10	Absent	Absent
S.fuscum hum type	na	Absent	Absent	Absent
S.fuscum hum %	1-3 (many indiv)	Absent	Absent	Absent
S.fuscum height(cm)	na	Absent	Absent	Absent
Leucobryum glaucum	Absent	Absent	Absent	Absent
Trichophorum type	Tussocks	Tussocks	Flats	Tussocks
Trichophorum %	4-10	1-3 (many indiv)	4-10	11-25

S.magellanicum %	4-10	Absent	4-10	Absent
S.cuspidatum %	na	Absent	Na	1-3 (many indiv)
S.papillosum %	1-3 (many indiv)	Absent	4-10	Absent
S.denticulatum %	na	Absent	Na	Absent
S.capillifolium%	51-75	34-50	26-33	34-50
S.tenellum %	na	4-10	Na	4-10
S.subnitens %	na	Absent	Na	Absent
R.fusca %	Absent	Absent	Absent	Absent
R.alba %	na	1-3 (several indiv)	4-10	1-3 (many indiv)
N.ossifragum %	1-3 (many indiv)	1-3 (many indiv)	1-3 (many indiv)	1-3 (many indiv)
Sphag pools %	Absent	Absent	Absent	Absent
Dominant pool Sphag				
Sphag lawns %	Absent	Absent	4-10	Absent
Sphag humm %	34-50	34-50	34-50	34-50
Sphag holl %	4-10	1-3 (many indiv)	11-25	1-3 (many indiv)
Total Sphag %	51-75	34-50	34-50	34-50
Hummocks indicators	S. austinii & S. fuscum	S. austinii		Absent
Cladonia portent %	11-25	34-50	4-10	34-50
Other Cladonia sp	Absent		Absent	
C. panicea %	Absent	Absent	Absent	Absent
Calluna cover %	11-20	34-50	11-20	34-50
Calluna height(cm)	11-20	21-30	31-40	21-30
Other NotableSpecies				Previously 9/7/10
		Previously		Previously mapped
Other comment		mapped as sub-	Stable	as sub-central
		central (Qsc1)		(Qsc2)
Date	06/10/2004	10/10/2011	06/10/2004	10/10/2011

Ecotope type	Sub-central	Sub-central
Complex Name	9/7 + p	9/7+P
Quadrat Name	Qsc3	Qsc3
Easting	208688	208695
Northing	278657	278658
Firmness	Quaking	Quaking
Burnt	No	No
Algae in hollows %	4-10	Absent
Algae in pools %	4-10	Absent
Bare peat %	Absent	1-3 (several indiv)
High hummocks %	na	4-10
Low hummocks %	26-33	34-50
Hollows %	11-25	4-10
Lawns %	11-25	11-25
Pools %	11-25	11-25
Pool type	Regular	Regular
S.austinii hum type	na	Relic
S.austinii hum %	4-10	1-3 (many indiv)
S.austinii height(cm)	na	31-40
S.fuscum hum type	Absent	Absent
S.fuscum hum %	Absent	Absent
S.fuscum height(cm)	Absent	Absent
Leucobryum glaucum	Absent	Absent
Trichophorum type	Flats	Absent
Trichophorum %	4-10	Absent
S.magellanicum %	11-25	11-25
S.cuspidatum %	4-10	1-3 (many indiv)

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S.papillosum %	11-25	11-25
S.denticulatum %	na	Absent
S.capillifolium%	11-25	11-25
S.tenellum %	na	1-3 (many indiv)
S.subnitens %	na	Absent
R.fusca %	Absent	Absent
R.alba %	4-10	4-10
N.ossifragum %	1-3 (many indiv)	1-3 (many indiv)
Sphag pools %	11-25	4-10
Dominant pool Sphag	S. cuspidatum	S. magellanicum
Sphag lawns %	11-25	11-25
Sphag humm %	26-33	26-33
Sphag holl %	11-25	Absent
Total Sphag %	51-75	51-75
Hummocks indicators	S. austinii	S. austinii
Cladonia portent %	11-25	1-3 (many indiv)
Other Cladonia sp	Absent	C. uncialis
C. panicea %	Absent	Absent
Calluna cover %	26-33	34-50
Calluna height(cm)	11-20	11-20
Other NotableSpecies		M. trifoliata, V. oxycoccos
Other comment	wetter	
Date	06/10/2004	10/10/2011

## Appendix IV Survey map





