Flughany Bog (SAC 000497), Co. Sligo

Executive Summary

This survey, carried out in October 2012, aimed to assess the conservation status of habitats listed on Annex I of the European Habitats Directive (92/43EEC) on the high bog at Flughany 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 11.40ha (7.63%) of the high bog area. High quality Active Raised Bog comprises only 1.67ha, consisting of both central ecotope (1.44ha) and active flushes (0.23ha). Central ecotope has deep, interconnecting pools, with frequent open water, low hummocks, high hummocks, hollows and lawns. Total *Sphagnum* cover is approximately 40%. The active flush areas include a large pool/lawn with a high cover of *S. cuspidatum*, and also low hummocks. *Sphagnum* cover reaches up to 75% in places.

Degraded Raised Bog covers 138.02ha (92.37%) 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 and permanent pools and *Sphagnum* lawns are mostly absent. The habitat also includes substantial areas of 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. At Flughany Bog, this habitat was most common in the central ecotope.

Restoration works, such as the blocking of drains, have not yet been carried out at the site.

The current conservation objective for Flughany 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 61.13ha. 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 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 at Flughany Bog in the 2005 to 2012 period. However, the mapped distribution of the habitat has changed somewhat, although central ecotope consists now, as it did in 2005, of three distinct areas – **C1**, **C2,** and **C3** – albeit with substantially redrawn boundaries. Three new areas of sub-central ecotope, **Sc4**, **Sc5,** and **Sc6**, have been identified, although their addition to the site is attributed to the more comprehensive field surveying in 2012, which resulted in more accurate mapping, rather than actual changes in habitat quality. A new area of active flush – flush **W** – has also been identified, and this too has been attributed to the more comprehensive field surveying carried out in 2012, as the area in which it is found was not surveyed in 2005. However, its location in an old cutover area leaves open the possibility that it may have developed during the reporting period.

Peat cutting, drainage and a significant fire event have been the most damaging impacts in the current reporting period, although peat cutting has now declined to 3 active plots identified in 2013. However, 0.22ha of high bog were lost in the reporting period due to peat cutting. 9.787km of high bog drains remain functional and 2.670km reduced functional. 132.50ha of high bog (of the total 149.43ha of high bog) were estimated to have been effected by a recent fire.

Active Raised Bog has been given an overall **Unfavourable Bad–Declining** conservation status assessment. Habitat Area and quality 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. In addition, restoration works have yet to be implemented. The recent trends in Area and S&Fs suggest there should be no imminent decline in habitat Area or quality, however a decrease in Area or decline in quality cannot be ruled out.

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 Flughany Bog 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 cutover areas; further hydrological and topographical studies to ascertain more accurate FRVs; further botanical monitoring surveys, including surveys on the high bog and cutover to assess the efficiency of any future restoration works that may take place; 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	000497	**6" Sheet:**	MO 52 & SO44
Grid Reference:	G 600 060	**1:50,000 Sheet:**	32
High Bog area (ha):	149.42ha [1]		
Dates of Visit:	16 to 18/10/12		
Townlands:	Flughany, Cloonfeightrim, Ogham, Mountirvine, Knocknahoo & Gortygara.		

[1] The current extent of the high bog is 149.42ha, while that reported in 2005 was 138.69ha (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. In addition, a high bog area already within the SAC in 2004, which is located to the northeast of the site, is now mapped and reported as part of the site's high bog. High bog area has in fact decreased in the 2005-2012 period due to peat cutting. The actual high bog extent in 2005 was 149.64ha (see tables 8.1 and 8.3 2005 (amended) figures).

Site location

Flughany Bog is situated on the Sligo/Mayo border, approximately 7km northeast of Charlestown in Co. Mayo and 5.5km southeast of Tobercurry in Co. Sligo. Tawnaghbeg Bog (SAC 002298) is approximately 2km southwest of Flughany, while several raised bogs - Derrynabrock Bog, Gowlan Bog and Kilgarriff Bog - which form part of the River Moy SAC (SAC 002298), lie to the southwest. Flughany Bog is readily accessible from roads to the east, west and south of the site. Gravelled tracks on the eastern side, by which the site was accessed for the present survey, are immediately adjacent to the high bog margin.

Description of the survey

The survey was carried out in October 2012 and involved a vegetation survey of the high bog at Flughany Bog and the recording of impacting activities affecting high bog vegetation. A similar survey was carried out in 2005 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 Flughany Bog was re-surveyed. Sections mapped as sub-marginal, sub-central and central ecotope in 2005 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 2005 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

Flughany Bog has been classified as a Ridge Basin type bog, and as an intermediate type, indicating that it shares features with blanket bogs, such as undulating terrain, and the absence of a definite dome (Kelly *et al*., 1995). Cross (1990) classified it as a Western/Intermediate type raised bog. The bog has been significantly modified by peat cutting and drainage, with the northern section the more badly affected. A mineral ridge near the centre of the site roughly divides the bog into two parts.

Ecological Information

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

The following Raised Bog EU Annex I habitats, are found in Flughany 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 Flughany Bog is 11.40ha (7.63% of the high bog), which is a decrease of 1.0ha since 1994. Active Raised Bog at the site includes central and sub-central ecotope, and active flushes.

Central ecotope was found at three locations (**C1** to **C3**) (see Appendix IV, Map 1). A single community complex, complex 35, was recorded in the ecotope. Characterised by deep, interconnecting pools with frequent open water, the micro-topography also included low hummocks, high hummocks, lawns and hollows. *Sphagnum cuspidatum* was the dominant pool *Sphagnum* species, with *S. denticulatum* also recorded, but uncommon. Total *Sphagnum* cover was approximately 40%. *Eriophorum angustifolium* was present in pools, while *S. papillosum* was common at pool edges. *Campylopus atrovirens* was also present, but uncommon, at pool edges. Interpool hummocks were dominated by *S. capillifolium*. Other common species in interpool areas were *Narthecium ossifragum*, *Eriophorum vaginatum* and *Carex panicea*. High hummocks, with tall *Calluna vulgaris*, *Hypnum jutlandicum*, *Pleurozium schreberi* and *Racomitrium lanuginosum*, were present, but rare, in the complex.

Sub-central ecotope was found at six locations (**Sc1** to **Sc6**) (see Appendix IV, Map 1). Three community complexes – 9A/10, 6+P and 9/7/6+P - were recorded. 9A/10 consisted of low hummocks and hollows. Total *Sphagnum* cover was in the range of 51-75%, much of which was accounted for by the frequency of *S. capillifolium* hummocks. *S. papillosum* was also frequent on low hummocks and in hollows, while *S. tenellum* and *S. cuspidatum* were also present but uncommon. Common species included *Calluna vulgaris*, *Eriophorum angustifolium*, *E.* vaginatum and *Narthecium ossifragum.* Burn damage was evident in the complex in the form of charred, dead tall *Calluna vulgaris* stems and damaged *Sphagnum* hummocks.

6+P was characterised by the presence of interconnecting pools with *Sphagnum* cover – mostly *S. cuspidatum* and *S. papillosum* - varying from approximately 40-80%. *Campylopus atrovirens* was occasional at pool edges, while *S. papillosum* was common on low hummocks around the edges of pools. The interpool flats were dominated by *Narthecium ossifragum*, with significant cover of *Carex panicea*. *S. capillifolium* was also common in low hummocks in the interpool areas. There were indications of flushing in the complex, where it occurred in the sub-central area, **Sc6**. Large

hummocks of *Calluna vulgaris* were present, though mostly somewhat fire-damaged, while *Aulacomnium palustre*, *Dicranum scoparium* and *Pedicularis sylvatica* were also recorded. Where the complex was mapped in the sub-central area **Sc1**, there were occasional *Leucobryum glaucum* hummocks.

Complex 9/7/6+TP had approximately 40% cover of tear pools, with variable *Sphagnum* cover. *S. cuspidatum* was the dominant pool *Sphagnum*. The quality of interpool habitat varied somewhat, with some parts having high *Sphagnum* cover, while others had lower *Sphagnum* cover and higher cover of *Narthecium ossifragum*. Total *Sphagnum* cover was in the range 34-50%. *Sphagnum* species included *S. capillifolium*, *S. papillosum S. tenellum* and *S. fuscum*. Other common species included *Calluna vulgaris*, *Eriophorum vaginatum* and *E. angustifolium*. There was a flushed element to the sub-central ecotope vegetation in the northeast of the site where this complex occurred, with some sparse *Molinia caerulea* and occasional *Aulacomnium palustre* and *Dicranum scoparium*. Burn damage, in the form of charred, dead tall *Calluna vulgaris* stems and dead *Sphagnum* on low hummocks, was seen throughout the complex. *Rhynchospora fusca* was recorded in the complex.

A small part of the large flush **Z** is an active, peat forming area with very soft to quaking ground and total *Sphagnum* cover of 51-75%. Much of the flush area was composed of a single large pool/lawn with a high cover of *S. cuspidatum* and smaller patches of *S. magellanicum*. Small hummocks of *Aulacomnium palustre* were present around the pool edge and dotted through the pool/lawn. *Sphagnum* hummocks around the edge of the pool were largely composed of *S. capillifolium*, while *S. papillosum* hummocks and *Eriophorum angustifolium* were common around lawns. *Pleurozium schreberi* and *Vaccinium oxycoccos* were also present on hummocks, while *Molinia caerulea* was present, though sparse, throughout. This active flush zone may have been more extensive before a recent burn event, which has severely damaged the vegetation in the western side of the area. All tall *Calluna vulgaris* here was burnt, and low *Sphagnum* hummocks severely damaged.

Flush **W** is a newly recorded active flush in old cutover at the southeastern extreme of the site. The addition of this very small flushed area is likely to be the result of more comprehensive surveying in 2012, which resulted in more accurate mapping, as the area wasn't comprehensively surveyed in 2005 (Fernandez *et al*., 2005). However, as the flush is located in an old cutover area, it may have developed in the reporting period.

Degraded Raised Bog (7120)

The current area of Degraded Raised Bog at Flughany Bog is 138.02ha (92.37% of the high bog).

Degraded Raised Bog includes the sub-marginal, marginal and face bank ecotopes, 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, and pools were present in some of the community complexes at the site. Small, regular pools, with approximately 10% cover of the complex area were present in 9/7/6+P, (described as a variant of 9/7/6, see Appendix I). The pools had a generally good cover of *S. cuspidatum*. *Menyanthes trifoliata* and *Eriophorum angustifolium* were also present, while *S. papillosum* was common at pool edges. Degraded Raised Bog micro-topography generally consisted of low hummocks, hollows and flats, dominated by species such as *Narthecium ossifragum* and *Carex panicea*. *Sphagnum* cover within the sub-marginal ecotope was as high as 26-33% in the wetter community complexes, while the commoner species within the ecotope included *Narthecium ossifragum*, *Calluna vulgaris*, *Carex panicea* and *Eriophorum vaginatum*.

Sphagnum capillifolium was the dominant species in *Sphagnum* hummocks, while *S. papillosum* and, to a lesser degree, *S. subnitens* and *S. tenellum*, were also present. Small hummocks of *S. austinii* and *S. fuscum* were also found. Much of the sub-marginal ecotope at Flughany Bog was, in common with the other ecotopes, significantly affected by a recent fire event, the results of which were most obviously seen in burnt *Sphagnum* hummocks, charred tussocks, and charred tall *Calluna vulgaris* stems.

Marginal ecotope is slightly drier than sub-marginal ecotope and occurs mostly around the margins of the high bog, in some places as a narrow band, but elsewhere, particularly in the northern part of the site, as a broad swathe of habitat, occupying a substantial part of the high bog. The micro-topography consists of *Calluna vulgaris* hummocks, low *Sphagnum* hummocks, flats, hollows, and very occasional tear pools. *Sphagnum* cover is lower than that of the sub-marginal ecotope, reaching a maximum of 10% cover in the wetter parts of the ecotope. The vegetation is characterised by a high cover of species such as *Calluna vulgaris*, *Narthecium ossifragum*, *Eriophorum vaginatum*, *E. angustifolium*, *Carex panicea* and *Trichophorum germanicum*.

Face bank ecotope is characterised by firm ground, tall *Calluna vulgaris*, poor *Sphagnum* cover and a flat micro-topography. It is present very intermittently around the high bog margin.

There are also several inactive flushes on the high bog (flushes **X, Y** and **Z**), which collectively occupy a substantial proportion of the total site area. Mostly dominated by *Molinia caerulea*, with firm ground, and *Sphagnum* cover reaching a maximum of approximately 20% in the wettest areas,

these inactive flushes had also seen burn damage, ranging from moderate to severe, which was generally evident in the dead, charred stems of *Calluna vulgaris* and *Myrica gale*, and dead *Sphagnum* on low hummocks. Small pools, containing *S. cuspidatum* and the uncommon *S. fallax*, were present at 1-2% cover in flush Y.

Depressions on peat substrates of the Rhynchosporion (7150)

Rhynchosporion vegetation is widespread on Flughany 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, particularly those in the central complex 35, where it was most frequent. In these areas, the Rhynchosporion vegetation occurs within *Sphagnum* hollows and along *Sphagnum* pool edges and on lawns. Typical plant species include *Rhynchospora alba, Sphagnum cuspidatum, S. papillosum* and *Eriophorum angustifolium*.

R. alba was also found within degraded raised bog, but was generally uncommon and always associated with wet features such as hollows and run off channels.

Rhynchospora fusca was found at a single location in community complex 9/7/3+TP in the sub-central **Sc3** area (grid ref: E161961/N307335).

Bog Woodland

Bog Woodland not present at the site.

Detailed vegetation description of the high bog

A detailed description of high bog vegetation recorded during the 2012 survey of Flughany 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 Flughany 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	H	-1	0.22ha of the high bog cut away	Inside High Bog: 4 locations in the east and southwest of the high bog	**7120**
C01.03	Peat extraction	L	-1	0.22ha of the high bog cut away	""	**7110/7150**
J02.07	Drainage	M	-1	12.457km [1]	Inside High Bog	**7110/7120/7150**
J02.07	Drainage	L	-1	n/av	Outside High Bog	**7110/7120/7150**
B01.02	Artificial planting on open ground (non-native trees)	L	-1	0.04ha	Outside High Bog	**7110/7120/7150**
J01	Fire	M	-1	132.50ha	Inside High Bog	**7110/7120/7150**

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.

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

Peat cutting

Peat cutting has taken place at 4 locations on the high bog in the 2004-2010 period, consisting of 1 plot in the southwest, and 3 in the east (lobe 5); and also at one location on the eastern cutover adjacent to the high bog (E161330/N306406). Peat cutting at the east of the high bog includes one plot immediately outside the SAC boundary but on the high bog. Cutting at two of the three plots here is by machine, causing considerable localised damage on the high bog where large areas have been denuded of vegetation.

Peat cutting has reduced the area of high bog by 0.22ha in the current reporting period, a figure calculated using GIS techniques on aerial photography from 2004/05 and 2010. As aerial photography is not available post 2010, it cannot be ruled out that cutting may have taken place in additional locations in 2011. Information from the NPWS indicates that no cutting took place in 2012, but 3 turf plots were cut in 2013. Further high bog therefore has been lost and the figure of

0.22ha should be considered a minimum value. As the loss of high bog area has been in marginal ecotope (table 8.3), peat cutting is assessed as having a high intensity negative impact in Degraded Raised Bog (7120). As there has been no loss of Active Raised Bog (7110) and therefore, no likely loss of habitat in Depressions on peat substrates of the Rhynchosporion (7150) in the reporting period, the impact is assessed as being of low intensity in these habitats. However, it must 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 (11.40ha or 7.63% of the high bog) and is 81.35% below the FRV target (table 8.4). In addition to the direct effects of peat cutting, old face banks and high bog and cutover drainage associated with cutting continue to cause negative impacts on the high bog habitats.

Four commercial turf cutting businesses were operating at the site until quite recently, but all commercial turf cutting has now been discontinued for several years (NPWS, 2005). Kelly *et al*. (1995) reported peat cutting by hand and machine on all edges of the bog (with the exception being parts of the south and northwest), and also in the extensive cut-away to the south of the site.

Fernandez *et al*. (2005) noted a significant decline in the intensity of peat-cutting between 1994 and 2005, with the length of bog margin cut decreasing from 26% to 2.6% in that period. The decline was attributed principally to a relocation strategy implemented by the NPWS that involved the purchase of an alternative area for cutting and the transfer of turbary rights from Flughany Bog to the newly purchased site.

The recent decline in peat cutting at the site is illustrated by the restriction of the activity to just four plots in the period 2005-2010, and no active plots were identified in 2012. A continued cessation of the practice could contribute to the recovery of the bog, and facilitate the implementation of restoration works such as the blocking of drains, which could not be effectively employed were the practice still continuing.

Drainage

High bog drainage

Table 6.2 shows a decrease of (-)0.215km in functional drainage and corresponding increase in reduced functional drainage, as a result of a change in status of a single drain, b3A (table 6.3). There has been no drainage blocking or other restoration works at the site, so this minor change is likely to be the result of the natural infilling of a drain. The majority of drains in the high bog remain functional (9.787km), or reduced functional (2.670km), while 0.742 km remains non-functional.

Flowing water was observed in the b13 and b21 drain complexes during the site survey.

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

Table 6.2 High bog drainage summary

Status	2005 (km) [1]	2012 (km)	Change
NB: functional	10.002	9.787	(-)0.215
NB: reduced functional	2.455	2.670	(+)0.215
NB: non- functional	0.742	0.742	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

[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 detailed description of the drainage present on the high bog at Flughany, including any change in their functionality in the 2005 – 2012 reporting period (see Map 3).

Table 6.3 High bog drainage detail

Drain Name	Length (km)	2005 status	2012 status	Change	Comment
bA;A1; B;C;E;F; F1;G1; G2;H;J	2.849	NB: functional	NB: functional	No	Drain bA1 was wrongly classified as non-functional in 2004; drains bG1;bG2 were wrongly classified as non-functional in 2004;bE and bJ drain complexes
b1	0.119	NB: functional	NB: functional	No	This drain was wrongly classified as reduced functional in 2004
b2	0.212	NB: functional	NB: functional	No	This drain was wrongly classified as reduced functional in 2004
b3	0.202	NB: functional	NB: functional	No	
b3A	0.215	NB: functional	NB: reduced functional	Yes	
b4	0.284	NB: functional	NB: functional	No	
b5	0.305	NB: functional	NB: functional	No	
b6	0.151	NB: reduced functional	NB: reduced functional	No	
b7-9	0.316	NB: functional	NB: functional	No	Drain 7 was wrongly

					classified as reduced functional in 2004
b10	0.227	NB: functional	NB: functional	No	
b11	0.098	NB: functional	NB: functional	No	This drain was wrongly classified as non-functional in 2004
b12	0.027	NB: reduced functional	NB: reduced functional	No	
b13	0.998	NB: functional	NB: functional	No	Drain complex; these drains were wrongly classified as reduced functional in 2004; water flowing recorded within some of them during visit
b14	0.282	NB: functional	NB: functional	No	
b15	0.315	NB: functional	NB: functional	No	This drain was wrongly classified as non-functional in 2004
b16	0.218	NB: functional	NB: functional	No	Eastern section of drain was wrongly classified as non-functional in 2004
b16	0.384	NB: non-functional	NB: non- functional	No	Western section of drain
b17	0.723	NB: functional	NB: functional	No	Southern section of drain was wrongly classified as reduced functional in 2004
b18	0.191	NB: reduced functional	NB: reduced functional	No	
b20	0.075	NB: reduced functional	NB: reduced functional	No	
b21	0.557	NB: functional	NB: functional	No	Drain complex; water flowing recorded during visit
b22;23; 26	0.376	NB: functional	NB: functional	No	Drain 26 was wrongly classified as reduced functional in 2004
b24;25; 27	0.305	NB: reduced functional	NB: reduced functional	No	
b28-31	0.585	NB: functional	NB: functional	No	These drain were wrongly classified as reduced functional in 2004
b32	0.100	NB: reduced functional	NB: reduced functional	No	
b33	0.062	NB: functional	NB: functional	No	This drain was wrongly classified as reduced

					functional in 2004
b34;35	0.79	NB: reduced functional	NB: reduced functional	No	
b36	0.61	NB: functional	NB: functional	No	This drain was wrongly classified as non-functional in 2004
b37	0.358	NB: non-functional	NB: non- functional	No	
b38	0.408	NB: functional	NB: functional	No	This drain was wrongly classified as non-functional in 2004
b39-45	0.979	NB: reduced functional	NB: reduced functional	No	This drain was wrongly classified as non-functional in 2004
b46-47	0.153	NB: reduced functional	NB: reduced functional	No	Drain already present in 2005 but not mapped
b48;49; 52;53	0.590	NB: functional	NB: functional	No	
b50;51	0.395	NB: reduced functional	NB: reduced functional	No	Drain already present in 2005 but not mapped

Bog margin drainage

The cutover areas were not surveyed for drains during 2012, although drains associated with either currently active or no longer active peat cutting are present in the cutover, and continue to drain the high bog and impact on high bog habitats.

Agricultural land drainage maintenance has been identified on the 2010 site aerial photographs, in a number of places adjacent to the high bog: a 300m stretch of drainage approximately 100m to the north of the high bog (E161452/N307671); 700m of drainage immediately adjacent to the high bog on the southern side (E161117/N305926); and 250m of drainage, adjacent to the north-eastern edge of the high bog (162366E/N307331).

Bog margin drainage is considered to have an impact of low importance on high bog habitats.

Fire history

An estimated 132.50ha, of the total high bog area of 149.43ha, has been affected by a recent fire event that has caused moderate to severe damage to vegetation throughout the affected areas. Only the most easterly (previously un-surveyed) part of the site has been unaffected by this burn episode. Damage to vegetation was most obviously seen on hummocks, where varying amounts of dead *Sphagnum* material were frequently noted. Charred, dead stems of tall *Calluna vulgaris* and

other shrubs such as *Myrica gale*, were frequent, and *Cladonia* lichens, of which *C. portentosa* is usually a common and widespread bog species, were generally absent from the burnt areas, reflecting their sensitivity to fire damage. Charred tussocks and bare peat were other frequent indicators of the recent burn. Given the severity of damage and the area involved, this burn event has been assessed as an impact of medium importance on all of the high bog habitats (table 6.1).

Burning has not been a frequent occurrence in the recent past, as both Fernandez *et al*. (2005) and Kelly *et al*. (1995) did not record any evidence of recent burning, and Douglas and Grogan (1986) referred to light burning that had taken place some years prior to their survey.

Controlled burning in the past, associated with peat cutting in the western portion of the site was mentioned in the NPWS Site Conservation plan for Flughany Bog (NPWS, 2005).

Invasive species

A single *Rhododendrum ponticum* plant, to the northwest of drain b37, in the southeast corner of the site, was the only record of invasive species noted at the site. Invasive species may, therefore, be regarded as having a negligible impact on high bog habitats and their impact is not registered among those having a significant effect on high bog habitats (table 6.1).

Fernandez *et al*. (1995) also recorded only a single *R. ponticum* in their assessment of invasive species.

Afforestation and forestry management

A small Sitka Spruce (*Picea sitchensis*) plantation of 900m^2 (or 0.09ha) was planted on cutover at the south of the site c.1990. Drains were also dug in this area at the time of planting (NPWS, 2005). The current area of the plantation is estimated here as only 0.04ha, suggesting the plantation may have been partially felled, or otherwise substantially removed. The impact is recorded as one of low intensity (table 6.1).

Other impacting activities

Local roads form part of the western and southern site boundaries, and there are a number of tracks/bog roads in the eastern part of the site, including some that isolate a number of smaller lobes from the main body of high bog. These tracks have allowed easy access to the bog for turf cutting, and have also been associated with high levels of dumping in the past (NPWS, 2005). Several abandoned tracks, with associated functional and reduced functional drains, that cut across the high bog have re-vegetated with high bog vegetation (Fernandez *et al*., 2005).

Poaching, due to encroachment by livestock, has previously been noted on the high bog (Kelly *et al*., 1995), but no evidence of such was recorded during the present survey, nor was there any evidence of it recorded by Fernandez *et al*. (2005).

Kelly *et al*. (1995) made reference to the reclamation of agricultural land on cutaway areas to the southeast of the high bog. Given the extent to which the bog has been exploited for turf cutting, this is likely to have been a significant impact over time, although there was no evidence of the impact in the current 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 and has bought out some turbary rights and ownership rights in recent years. This has contributed to the reduction in peat cutting, to the point where no active plots were identified in 2012.

The site Conservation Plan refers to the process of transferring turbary rights from this site to the adjacent Derrykinlough Bog. At the time of publication of this plan, the Department of the Environment and Local government (DELG) owned 25% of the site, with the remainder held by the Irish land Commission and multiple private owners (NPWS, 2005).

Ongoing management strategies in the site Conservation Plan (NPWS, 2005), include the continued purchasing of remaining land and turbary rights, with priority given to the purchase of the high bog in the more intact southern lobe of the site, where most of the Active Raised Bog is concentrated. Drain blocking and dam construction, again focussing on the southern lobe of the site, also form part of the intended conservation strategy for the site (NPWS, 2005).

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

Although table 8.1 indicates no change in the area of Active Raised Bog over the reporting period, the mapped distribution of the habitat has changed considerably and a number of previously unknown peat-forming areas have now been mapped. Central ecotope was formerly comprised almost entirely of the large **C1** in the south lobe of the high bog, while the remainder consisted of two very small areas, **C2** near the northwest side of **C1**, and **C3** to the south of **C1**. The large central area has now seen significant boundary changes and is split into **C1** to the north and the larger **C2** to the south. These changes are due to more comprehensive surveying in 2012 which has resulted in more accurate mapping of habitats. **C3** has seen slight boundary changes and is now slightly larger than before. Again, this change can be attributed to the more comprehensive surveying carried out in 2012, rather than a real change in habitat area.

The sub-central **SC1**, which formerly surrounded the old **C1**, **C2** and **C3** areas, occupies a similar area as before (and now surrounds the new **C1**, **C2** and **C3**) but has undergone numerous minor boundary changes and is now slightly smaller than before. **Sc2**, to the north of flush **Z**, and **Sc3**, in lobe 3 in the northeast of the site, have seen some slight boundary changes and are now slightly larger than before. **Sc4** and **Sc5** in lobe 3 are both previously unmapped areas of Active Raised Bog. The areas in which they occur were either not surveyed or poorly surveyed in 2005, so their presence now is attributed to the more comprehensive surveying carried out in 2012, rather than any real change in the occurrence of peat-forming habitat on the high bog. The same may be said of the newly-mapped **Sc6**, a substantial body of sub-central ecotope in the southern end (lobe 1) of the site.

The boundary of the active area of flush ***Z*** has been remapped and is now slightly larger than before. As with many of the boundary changes at the site, this is thought likely to be the result of more comprehensive surveying in 2012, which resulted in more accurate mapping. Flush **W,** in the south-eastern extreme of lobe 1, was not previously mapped, and although the area in which it occurs was not surveyed in 2004, suggesting a case of more comprehensive surveying and mapping, its existence in an old cutover area could indicate a development that has occurred within the current reporting period. Because of this uncertainty, it has not been recorded as a real increase in the total area of Active Raised Bog.

In summary, the areas of each of the individual Active Raised Bog ecotopes, i.e. those of central ecotope, sub-central ecotope and active flushes, are considered to be unchanged in the reporting period (table 8.1), despite the numerous boundary changes. The most substantial change in the distribution of Active Raised Bog has been the addition of the large, but previously unmapped, **Sc6** in the southern part of the site.

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 61.13ha (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 (11.40ha) is 81.35% below the FRV. A current Area value more than 15% below FRV falls into the **Unfavourable Bad** assessment category, and this, therefore, is the assessment that applies here to Active Raised Bog Area.

Although a long term (1994/5-2012) trend indicates an increase in the area of Active Raised Bog at the site of 1.00ha (see table 8.1), these data are not directly comparable with those of the present survey, due to the widely different survey methods used. A more recent and short term trend analysis (7 years; 2005-2012) indicates no change in Active Raised Bog. Therefore, the habitat Area is given a **Stable** trend assessment and **the Area of Active Raised Bog at Flughany 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 5.70ha (half of 11.4ha, the current area of Active Raised Bog). The current value is 1.67ha which is 70.70% below the FRV. As a

current central ecotope and active flush value more than 25% below FRV falls into the **Unfavourable Bad** assessment category, that is the assessment that applies here to S&Fs.

Although a long term trend (1994/5-2012) indicates a decrease in the combined area of central ecotope and active flush (4.46ha in 1994/5, compared to 1.67ha in 2012 (table 8.1)), a short term trend (7 years; 2005-2012) indicates no change in the combined area of central ecotope and active flush, and therefore, the S&Fs are given a **Stable** trend.

Quadrats analysis (**Qc1, Qsc2 and Qsc3**) indicates the following:

Qc1: this central ecotope quadrat was classified as community complex 4/35 in 2005, but as complex 35 in 2012. The different community complex classification is reflected in the greater abundance of *Rhynchospora alba* (11-25%) in the 2005 quadrat, compared to <1% in 2012. Other differences include the greater cover of *Narthecium ossifragum* in 2012 (<1% in 2005; 11-25% in 2012). Pool cover was higher in 2012 - 34-50%, compared to 26-33% in 2005. Other small changes, such as the greater abundance of *S. cuspidatum* and *S. papillosum* in 2012, are likely to be associated with the different cover of pools/*Sphagnum* pools. Total *Sphagnum* cover in 2005 was 34-50% and 51-75% in 2012. Slight burn damage in 2012 probably accounts for the lower cover of *Cladonia portentosa* and lower *Calluna vulgaris* height.

Many of the differences between the quadrats may be due to a slight discrepancy in location, as the 2012 quadrat included pool cover of 34-50%, whereas the 2005 quadrat had only 26-33%, despite the fact that the 2005 description of community complex 4/35 includes total pool cover of 20-30%, compared to an estimated 20% in complex 35 in the present report (Appendix I).

Qsc2: Quadrat Qsc2 was classified as complex 4/9+P in 2005 and as complex 6+P in 2012. One significant difference between the two quadrats was pool cover – 4-10% in 2005 and 11-25% in 2012 – a feature likely to account for the greater abundance of both *Sphagnum cuspidatum* and *S. papillosum* in 2012. *S. cuspidatum* had only <1% cover in 2005 and 4-10% cover in 2012, while *S. papillosum* had 4-10% cover in 2005 and 11-25% cover in 2012. Total *Sphagnum* cover was 11-25% in 2005 and 34-50% in 2012. The different community complex classifications were reflected in the presence in 2005 of *Rhynchospora alba* at 4-10% cover and its absence in 2012. *Narthecium ossifragum*, however, was present in both quadrats, at 4-10% cover. Severe burn damage in 2012, which was not issue in 2005, would account for the absence of *Cladonia portentosa*, and the lower *Calluna vulgaris* height recorded in 2012.

The overall differences between the quadrats are probably due to a slight variation in the quadrat location, and minor differences in interpretation.

Qsc3: this sub-central quadrat was classified as community complex 9/3+TP in 2005, but as complex 9/7/6+P in 2012. Curiously, the % cover of *Carex panicea* was recorded as 'n/a' in 2005, despite the fact that '3' in the community complex name signifies this species as one which jointly characterises the complex. Pools covered 34-50% of the quadrat in 2005, but only 11-25% in 2012, while low hummocks covered 4-10% of the 2005 quadrat and 34-50% of the 2012 quadrat. *Sphagnum* pool cover was in the range 26-33% in 2005 and 11-25% in 2012. Total *Sphagnum* cover was 34-50% in 2005 and 51-75% in 2012. Hollows accounted for 11-25% of the 2005 quadrat, but had <1% cover in 2012. Light burn damage in 2012 would account for the absence of *Cladonia portentosa*, and lower height range of *Calluna vulgaris*. Overall differences between the quadrats are relatively minor and may be due to a possible discrepancy in quadrat location. Although total *Sphagnum* cover was greater in 2012, the description of the 9/3+TP complex in 2005 (Fernandez *et al*., 2005) encompasses some habitat superior in quality to that represented by the 2005 **Qsc3** quadrat.

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

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

Future Prospects

There have yet to be any restoration works at the site that could have led to a favourable assessment for Future Prospects, and despite the fact that peat cutting, which has occurred intensively over long periods at the site, has been reduced to very low levels (3 active plots were identified in 2013), high bog and cutover drainage continues to have a significant negative effect on high bog habitats and will hinder any potential restoration of Degraded Raised Bog habitat to active peat forming communities.

Despite the lack of restoration works at the site, the NPWS has engaged in negotiations with landowners in relation to the cessation of peat cutting at the site and has bought out some turbary rights and ownership rights in recent years, which has contributed to the decline in peat cutting intensity. Although peat cutting has been assessed as having low impact on the habitat in the reporting period, future habitat Area losses or quality decline cannot be ruled out if this activity continues within the site.

Habitat **Area** is currently 81.35% below FRV (see table 8.4). Area and S&Fs were also given a stable trend assessment here, indicating a somewhat positive outlook may be appropriate. The recent decline in peat cutting at the site, brought about by active management of the issue, suggests that

there should be no imminent decline in Area or S&Fs, however this cannot be ruled out if the activity is initiated in other locations within the site or intensified. The lack of restoration works, and continued negative effects of impacts such as high bog and cutover drainage indicates that the habitats would not reach FRVs. 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 70.70% below FRV (see table 8.4) and a Declining trend is foreseen due to the ongoing threat from impacting activities. Therefore S&Fs are expected to more than 25% below FRV in the following two reporting periods. Thus, **S&Fs Future Prospects** are assessed as **Unfavourable Bad-Declining**. **The overall habitat's Future Prospects are Unfavourable Bad – Declining** (see table 8.5).

Although peat cutting has greatly declined, its cessation is necessary and the blocking of remaining functional and reduced-functional drains both on the high bog and cutover will be essential, if the bog is to be restored to better condition. The cutover areas may be important in any future remedial works, as it may prove difficult to regenerate previous Active Raised Bog values on the high bog.

A recent fire event has had a significant detrimental effect on much of the high bog vegetation, indicating the importance of eliminating, or reducing the frequency of, such events.

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

Table 8.1 Changes in Active Raised Bog area

Active Ecotopes	1994[1]	2005	2005 (amended)	2012	Change (2005-2012)	
	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	%
Central	4.32	2.24	1.44	1.44	0.00	0.00
Sub-central	5.94	6.37	9.73	9.73	0.00	0.00
Active flush	0.14	0.14	0.23	0.23	0.00	0.00
Total	**10.4**	**8.75**	**11.40**	**11.40**	**0.00**	**0.00**

[1]These 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 2005 figures and 2005 amended figures. The latter shows the ecotope area believed to be present in 2005 after surveying improvements in 2012. The comparison between 2005 (amended) and 2012 illustrates the actual changes in ecotope area in the 2005-2012 period. Any change in ecotope area between the 2005 and the 2005 (amended) values is due to improvement in mapping accuracy and/or the result of a more comprehensive survey in 2012 (see table 8.2 for

further detail). The 1994 and 2005 figures do not include the area of lobe 5, in the eastern extreme of the site, as this area was not included in those surveys. However, the areas measured there in the current survey (comprising both marginal and sub-marginal ecotopes) has been included now in the 2005 (amended) and 2012 figures.

Table 8.2 Assessment of changes in individual Active Raised Bog areas

Area	Quadrats	Trend	Comment	Quadrats analysis
C1	None	Stable	Changes in boundary. Former large central ecotope area now corresponds with two separate areas (**C1** and **C2**). This change is the result of more comprehensive surveying in 2012 which resulted in more accurate mapping.	
C2	Qc1	Stable	Changes in boundary. Former large central ecotope area now corresponds with two separate areas (**C1** and **C2**). This change is the result of more comprehensive surveying in 2012 which resulted in more accurate mapping.	Pool cover 34-50% in 2012, 26-33% in 2005; greater abundance of *S. cuspidatum* and *S. papillosum* in 2012 (likely to be associated with higher pool cover); total *Sphagnum* cover in 2005 34-50%, 51-75% in 2012; greater abundance of *Rhynchospora alba* (11-25%**)** in 2005, compared to <1% in 2012; greater cover of *Narthecium ossifragum* in 2012 (<1% in 2005; 11-25% in 2012). Differences likely due to slight difference in quadrat location
C3	None	Stable	Slight changes in boundary (larger). This change is the result of more comprehensive surveying in 2012 which resulted in more accurate mapping.	
Sc1	Qsc2	Stable	Slight changes in boundary (smaller). This change is the result of more comprehensive surveying in 2012 which resulted in more accurate mapping.	Pool cover 4-10% in 2005 and 11-25% in 2012; *Sphagnum cuspidatum* and *S. papillosum* both more abundant in 2012; total *Sphagnum* cover 11-25% in 2005 and 34-50% in 2012; *Rhynchospora alba* 4-10% in 2005, absent in 2012; absence of *Cladonia portentosa* and lower *Calluna vulgaris* height in 2012 due to recent burn. Overall differences probably due to a slight variation in the quadrat location, and minor differences in interpretation.
Sc2	None	Stable	Slight changes in boundary (larger). This change is the result of more comprehensive surveying in 2012 which resulted in more accurate mapping.	
Sc3	Qsc3	Stable	Slight changes in boundary (larger). This change is the result of more comprehensive surveying in	Pool cover 34-50% in 2005, 11-25% in 2012; low hummocks 4-10% in 2005, 34-50% in 2012; *Sphagnum*

			2012 which resulted in more accurate mapping.	pool cover 26-33% in 2005 and 11-25% in 2012; total *Sphagnum* cover 34-50% in 2005 and 51-75% in 2012; hollows 11-25% in 2005 quadrat, but <1% in 2012; *Cladonia portentosa* absence and lower height range of *Calluna vulgaris* in 2012 due to recent burn. Overall differences between the quadrats relatively minor and may be due to a possible discrepancy in quadrat location.
Sc4	None	Unknown	This specific area was not surveyed in 2004. This is likely to be the result of more comprehensive surveying in 2012 which resulted in more accurate mapping.	
Sc5	None	Unknown	This specific area was not surveyed in 2004. This is likely to be the result of more comprehensive surveying in 2012 which resulted in more accurate mapping.	
Sc6	None	Unknown	This specific area was not surveyed in 2004. This is likely to be the result of more comprehensive surveying in 2012 which resulted in more accurate mapping.	
Z	None	Stable	Slight changes in boundary (larger). This change is the result of more comprehensive surveying in 2012 which resulted in more accurate mapping.	
W	None	Possibly newly developed	This specific area was not surveyed in 2004. This is likely to be the result of more comprehensive surveying in 2012 which resulted in more accurate mapping. However, as this is located in an old cutover area may have developed in the reporting period.	

Degraded Raised Bog (7120)

Area

The Degraded Raised Bog FRV for Area is 88.29ha at Flughany Bog. This value corresponds with the difference between the current high bog area (149.42ha) and the Active Raised Bog FRV (61.13ha) 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 56.33% bigger than FRV, and as this is over the 15% threshold, above which the assessment automatically falls into the **Unfavourable Bad** category, that is the assessment that applies to habitat area.

Table 8.3 shows a decline in the area of marginal ecotope of (-) 0.22ha, a loss attributed to turf cutting. As the other Degraded Raised Bog ecotopes were unchanged in area in the reporting period, (-) 0.22ha is also the total decrease in Degraded Raised Bog area for the reporting period. The loss of area indicates a **Decreasing** trend, and **the Area of Degraded Raised Bog at Flughany 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 34.51ha (25% of 138.02ha, the current area of Degraded Raised Bog). The current marginal and face bank ecotopes area value (72.70ha) which is 110.69% 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.

Table 8.3 shows a decrease of (-) 0.22ha in marginal ecotope, and no change in active flushes and face bank ecotope, in the reporting period. Thus, the overall decrease in area is (-) 0.22ha or (-) 0.25% of the total area. The loss of area in marginal ecotope is due to turf cutting in the reporting period, and the figure is calculated using GIS techniques on aerial photography from 2004/05 and 2010. As post-2010 aerial photography is not available for the site, it cannot be ruled out that additional losses may have resulted from unidentified turf plots in the period 2011-2012. The figure of (-) 0.22ha should, therefore, be regarded as a minimum value. 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). Thus, the DRB's S&Fs at Flughany 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 Flughany Bog are assessed as Unfavourable Bad-Stable (see table 8.5).

Future Prospects

The area of Degraded Raised Bog has decreased as a result of peat cutting. Furthermore, drainage on the high bog and within adjacent cutover and agricultural land continues to damage the habitat and to hinder its recovery to FRVs, as well as minimising the chances to convert face bank and marginal ecotope into sub-marginal and/or Active Raised bog. The strategy for conserving the bog has included the purchase of ownership rights and turbary rights, with the result that there has been a significant decline in turf cutting, with only 4 active plots identified in the 2004-2010 reporting period; none in 2012 and 3 in 2013. However, restoration works have yet to take place at the site, and this, coupled with the fact that a recent serious fire event indicates a continuing susceptibility to negative impacts, suggests that an unfavourable assessment is appropriate. The continuing negative impacts from high bog and marginal drainage also indicate that further losses cannot be ruled out.

Habitat **Area** is currently 138.02% above FRV (see table 8.4) and a Decreasing trend is expected in the following two reporting periods (12 years) as a result of ongoing high bog losses to 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 110.69% above FRV (see table 8.4). 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**.

The Future Prospects for Degraded Raised Bog are, therefore, considered to be Unfavourable Bad-Declining (see table 8.5)**.**

Table 8.3 Changes in Degraded Raised Bog area

Inactive Ecotopes	**1994**[1]	**2005**	**2005 (amended)**	**2012**	**Change (2005-2012)**	
	Area (ha)	**Area (ha)**	**Area (ha)**	**Area (ha)**	**Area (ha)**	**%**
Sub-marginal	50.73	54.45	50.56	50.56	0.00	0.00
Marginal[2]	58.97	58.12	71.02	70.80	(-)0.22	(-)0.31
Face bank[2]	1.14	2.46	1.90	1.90	0.00	0.00
Inactive flush	17.53	14.91	14.76	14.76	0.00	0.00
Total	**128.37**	**129.94**	**138.24**	**138.02**	**(-)0.22**	**(-)0.16**

[1]These 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 2012 marginal and face bank ecotope value given within the report should be taken as a maximum value. Their extent is based in the 2012 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 2011-2012 period associated with peat cutting.

Note: Table 8.3 includes 2005 figures and 2005 amended figures. The latter shows the ecotope area believed to be present in 2005 after surveying improvements in 2012. The comparison between 2005 (amended) and 2012 illustrates the actual changes in ecotope area in the 2005-2012 period. Any change in ecotope area between the 2005 and the 2005 (amended) values is due to improvement in mapping accuracy and/or the result of a more comprehensive survey in 2012.

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

Depressions on peat substrates of the Rhynchosporion (7150)

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 habitat is most frequently found and reaches its finest quality at the site in Active Raised Bog, particularly central ecotope (community complex 35). It is also found in sub-central ecotope, and in sub-marginal ecotope, and as the areas of these habitats have all remained stable in the reporting period. 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 are threatening 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 Flughany Bog is assessed as Unfavourable Bad-Declining (see table 8.5).

Table 8.4 Habitats favourable reference values

Habitat	Area Assessment			Structure & Functions Assessment		
	FRV Target (ha) [1]	2012 value (ha) [2]	% below target	FRV 2012 Target (ha) [3]	2012 value (ha) [4]	% below target
7110	61.13	11.40	81.35	5.70	1.67	70.70

[1] 1994 central, sub-central, active flush and sub-marginal ecotope area.

[2] 2012 central, sub-central ecotope and active flush 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.

[4] 2012 central ecotope and active flush area.

	FRV Target (ha) [5]	2012 value (ha) [6]	% above target	FRV 2012 Target (ha) [7]	2012 value (ha) [8]	% above target
7120	88.29	138.02	56.33	34.51	72.70	110.69

[5] Current high bog area minus 7110 area FRV.

[6] 2012 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–Stable.**
- **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	Future Prospects Assessment	Overall Assessment
7110	Unfavourable Bad-Stable	Unfavourable Bad-Stable	Unfavourable Bad – Declining	Unfavourable Bad – Declining
7120	Unfavourable Bad-Decreasing	Unfavourable Bad-Stable	Unfavourable Bad-Declining	Unfavourable Bad-Declining
7150	Unfavourable Bad-Stable	Unfavourable Bad-Stable	Unfavourable Bad-Declining	Unfavourable Bad-Declining

Conclusions

Summary of impacting activities

- Peat cutting continued at the site during the reporting period, but had declined to just 4 locations/plots on the high bog margin, and an additional single location on the adjacent cutover. 0.22ha of high bog have been lost in the period 2004-2010 due to peat cutting. 3 plots were reported as actively cut in 2013..
- 9.787km of drains on the high bog remain functional, while another 2.670km are reduced-functional. Functional and reduced functional drains continue to impact on high bog habitats and will do so until they are blocked and become completely in-filled and thus non-functional.
- Cutover drainage (peripheral drainage) associated with either currently active or no longer active peat cutting continue 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 north, northeast and south of the high bog.
- A recent fire event has affected the high bog, causing moderate to severe damage to vegetation over much of the site.
- The impact of invasive species on the high bog is negligible, as a single *Rhododendron ponticum* plant represented the entire record of such species at the site.

Changes in active peat forming areas

- There has been no change in the total area of Active Raised Bog at Flughany in the 2005 to 2012 period. However, the mapped distribution of habitats has changed in a number of ways, although most of these changes are attributed to the more comprehensive mapping exercise employed in the current survey. Central ecotope formerly consisted of three

distinct areas (**C1**, **C2** and **C3**) in the southern part of the bog, and this remains the case, although the individual boundaries have all seen substantial amendments as a result of the more comprehensive mapping procedure. The same may be said of the active flush **Z**, which is now slightly larger due to mapping refinements.

- Flush **W**, in the south eastern extreme of the high bog, is in an area not surveyed in 2005, and its addition to the mapped area of Active Raised Bog is, therefore, likely to be the result of more comprehensive surveying in 2012. However, as it is located in an old cutover area, there is a possibility that it may have developed in the reporting period. Nevertheless, it has not been included in the habitat area calculations as a real change in ARB extent, due to the uncertainty regarding its development.
- There were three newly-mapped areas of sub-central ecotope (**Sc4**, **Sc5** and **Sc6**), all of which were the result of more comprehensive mapping in 2012.

Other changes

- 0.22ha of high bog, all in marginal ecotope, was lost due to turf cutting in the 2004-2010 period
- Some previously unsurveyed and unmapped areas, to the east of the high bog (lobe 5), and to the north of flush **X**, were mapped during the current survey, leading to a recalculation of the total high bog area.

Quadrats analysis

- Quadrat **Qc**1: Recorded in complex 35 in 2012, but complex 4/35 in 2005. Higher total *Sphagnum* cover and pool cover in 2012, but differences likely due to slight discrepancy in quadrat location.
- Quadrat **Qsc2**: Recorded in complex 6+P in 2012, but complex 4/9+P in 2005. Higher *Sphagnum* cover in 2012; overall differences probably due to a slight variation in the quadrat location, and minor differences in interpretation.
- Quadrat **Qsc3**: Classified as complex 9/7/6+P in 2012 and 9/3+P in 2005; higher *Sphagnum* cover in 2012 and other minor differences due to discrepancy in quadrat location. 2005 quadrat also not representative of the best quality habitat in that complex.

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. The site Conservation Management Plan has involved the purchase of ownership rights and turbary rights, and the transfer of turbary rights to a newly purchased nearby bog. Despite these measures, peat cutting continued at Flughany during the current reporting period, although there were only four locations/plots identified during the period, and apparently no active turf cutting plots in 2012.

Summary of conservation status

- **Active Raised Bog** has been given an overall **Unfavourable Bad–Declining** conservation status assessment. Habitat Area and quality 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. In addition, restoration works have yet to be implemented. The recent trends in Area and S&Fs suggest there should be no imminent decline in habitat Area or quality, however a decrease in Area or decline in quality cannot be ruled out.
- **Degraded Raised Bog** has been given an **Unfavourable Bad-Declining** conservation status at Flughany Bog. Habitat Area has slightly decreased due to turf cutting. S&Fs have remained stable. Both habitat Area and S&Fs are above the FRV. 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 Flughany Bog. Habitat Area and quality (S&Fs) are considered to be unchanged in the reporting period. However, Future Prospects are considered Unfavourable Bad-Declining as a result of threatening impacting activities.

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

Recommendations

- **Cessation of peat cutting.** Current information indicates that 3 turf plots were actively cut in 2013.
- **Restoration works** including the blocking of high bog reduced-functional and functional drains, as well as cutover drains. The site Conservation Plan includes a strategy for drain blocking and dam construction, with provision for monitoring of the hydrological and ecological condition of the bog in the context of these proposed remediation measures

(NPWS, 2005). There is some obvious potential for improvements through the blocking of a number of deep (2m), unnamed, drains with strong water flow, near drains b13 and b14. This could re-wet adjacent cutovers, which are also some distance from agricultural land, and, therefore, not likely to be the cause of controversy. Some cutover drains to the northeast of lobe 1 also had flowing water and could be dammed in order to re-wet adjacent degraded bog.

- **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** on the high bog in order to assess change in habitat's conservation status; and botanical monitoring surveys of cutover areas if they should be included in the areas targeted for restoration.

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Appendix I Detailed vegetation description of the high bog

Active Raised Bog (7110)

Central Ecotope Complex

COMPLEX 35

- **Location**: south-east part of lobe 1, dominating **Sc1**,**Sc2** and **Sc3**
- **Ground**: soft to very soft
- **Physical indicators**: absent
- ***Calluna* height**: 21-40cm
- ***Cladonia* cover**: 5-10%
- **Macro-topography**: part depression, also very gentle slope to north-west
- **Pools**: deep, interconnecting, 20%
- ***Sphagnum* cover**: 40%
- ***Narthecium* cover**: 11-25%
- **Micro-topography:** low hummocks/high hummocks/hollows/pools/lawns
- **Tussocks:** absent
- **Degradation or regeneration evidence**: no
- **Species cover**: *Sphagnum capillifolium* (11-25%), *S. cuspidatum* (5-10%), *S. papillosum* (11-25%), *S. denticulatum* (1-4%), *S. tenellum* (1-4%), *Calluna vulgaris* (11-25%), *Rhynchospora alba* (1-4%), *Narthecium ossifragum* (11-25%), *Eriophorum vaginatum* (5-10%), *E. angustifolium* (1-4%), *Carex panicea* (1-4%), *Campylopus atrovirens* (<1%), *Pleurozia purpurea* (<1%).
- **Additional comments**: Pools within this complex were deep and had frequent open water. *Eriophorum angustifolium* was present in pools, while *S. papillosum* was common at pool edges. Interpool hummocks were dominated by *S. capillifolium*. *Campylopus atrovirens* was present at the edges of pools. High hummocks, with tall *Calluna vulgaris*, *Hypnum jutlandicum*, *Pleurozium schreberi* and *Racomitrium lanuginosum*, were present, but rare, in the complex.

Sub-Central Ecotope Complexes

COMPLEX 9A/10

- **Location**: in **Sc4** and **Sc5** in the north-east (lobe 3) of the high bog, and **Sc1** in the south (lobe 1)
- **Ground**: very soft
- **Physical indicators**: burn damage: dead tall *Calluna* stems, burnt *Sphagnum* hummocks
- ***Calluna* height**: 11-20
- ***Cladonia* cover**: <1%
- **Macro-topography**: small depression/gentle slope to south
- **Pools**: absent
- ***Sphagnum* cover**: 51-75%
- ***Narthecium* cover**: 5-10%
- **Micro-topography:** low hummocks/hollows
- **Tussocks:** absent
- **Degradation or regeneration evidence**: no
- **Species cover**: *Sphagnum capillifolium* (34-50%), *S. cuspidatum* (<1%), *S. papillosum* (11-25%), *S. tenellum* (1-4%), *Calluna vulgaris* (11-25%), *Eriophorum angustifolium* (11-25%), *E. vaginatum* (5-10%), *Narthecium ossifragum* (5-10%), *Carex panicea* (<1%), *Erica tetralix* (<1%).
- **Additional comments**: This complex was mapped in the sub-central areas **Sc4** & **Sc5**, both previously unmapped areas of sub-central ecotope, close to sub-central 3 in the north-east lobe of the bog. These additions to the Active Raised Bog (ARB) area cannot, however, be attributed to an improvement, or wetting of the area, as this area had been substantially excluded from the 2004/2005 survey (Fernandez *et al*., 2005). **Sc4** and **Sc5** are of similar species composition, although **Sc5** is probably of slightly lesser quality than **Sc4**, with a total *Sphagnum* cover estimated at 50%, compared to 60% in **Sc4**.

COMPLEX 6+P

- **Location**: characterising **Sc1** and **Sc6** in the south (lobe 1) of the high bog
- **Ground**: soft to very soft
- **Physical indicators**: moderate to severe burn damage to hummocks; tall *Calluna* stems burnt; bare ground <5%
- ***Calluna* height**: 0-10
- ***Cladonia* cover**: absent
- **Macro-topography**: depression
- **Pools**: interconnecting, 10-15%
- ***Sphagnum* cover**: 34-50%
- ***Narthecium* cover**: 11-25%

- **Micro-topography:** low hummocks/hollows/pools/lawns
- **Tussocks:** absent
- **Degradation or regeneration evidence**: no
- **Species cover**: *Sphagnum capillifolium* (11-25%), *S. cuspidatum* (5-10%), *S. papillosum* (5-10%), *S. magellanicum* (5-10%), *Calluna vulgaris* (11-25%), *Carex panicea* 5-10%(10%), *Eriophorum vaginatum* (5-10%), *E. angustifolium* (1-4%), *Narthecium ossifragum* (11-25%).
- **Additional comments**: *Sphagnum* cover in pools – mostly *S. cuspidatum* and *S. papillosum* - varied from approximately 40-80%. The interpool areas were dominated by *Narthecium ossifragum*, with significant cover of *Carex panicea*. *Campylopus atrovirens* was occasional at pool edges, while *S. papillosum* was common on low hummocks around the edges of pools. Occasional high hummocks were damaged by fire. There were indications of flushing in the complex, where it comprised the sub-central area, **Sc6**. Large hummocks of *Calluna vulgaris* were present, though now fire-damaged, while *Aulacomnium palustre*, *Dicranum scoparium* and *Pedicularis* sp. were also recorded. Where 6+P was mapped in sub-central 1 (Sc1), there were occasional *Leucobryum glaucum* hummocks.

COMPLEX 9/7/6+TP (TEAR POOLS)

- **Location**: this complex is found in **Sc2**, **Sc3**, **Sc4** and **Sc5**
- **Ground**: soft to very soft
- **Physical indicators**: burn damage: dead tall *Calluna*, burnt *Sphagnum* hummocks
- ***Calluna* height**: 11-25cm
- ***Cladonia* cover**: <1%
- **Macro-topography**: partly a depression, also gentle slope to north-west
- **Pools**: tears, interconnected, 40%
- ***Sphagnum* cover**: 34-50%
- ***Narthecium* cover**: 11-25%
- **Micro-topography:** low hummocks/tear pools/lawns
- **Tussocks:** *Eriophorum vaginatum* 5%
- **Degradation or regeneration evidence**: absent

  Species cover: *Sphagnum capillifolium* (5-10%), *S. cuspidatum* (11-25%), *S. papillosum* (5-10%), *S. tenellum* (1-4%), *S. fuscum* (<1%), *Calluna vulgaris* (11-25%), *Eriophorum vaginatum* (11-25%), *E. angustifolium* (5-10%), *Narthecium ossifragum* (11-25%), *Carex panicea* (1-4%), *Erica tetralix* (1-4%), *Trichophorum germanicum* (5%).

- **Additional comments**: The quality of interpool habitat varied somewhat, with some parts having high *Sphagnum* cover, while others had lower Sphagnum cover and higher *Narthecium ossifragum*. This complex defined the sub-central area, **Sc3**, in the northern lobe (lobe 3) of the bog. The southern part of **Sc3** was of generally lower quality, with isolated small patches of sub-marginal ecotope present. There was a flushed element to a part of this sub-central area, with some sparse *Molinia caerulea* and occasional *Aulacomnium palustre*, and *Dicranum scoparium*. Water appeared to be moving across this area of the bog towards the west or south-west, suggesting the potential for regenerating the adjacent area through the blocking of drains.

  Rhynchospora fusca was found in this complex

  The Quadrat **Qsc3** was recorded in this complex

Active flushes

FLUSH Z

- **Location**: north end of lobe 1; a small active zone within the large inactive flush **Z**
- **Ground**: very soft to quaking
- **Physical indicators**: recent burn damage; dead, charred *Calluna*; damaged and dead *Sphagnum* hummocks
- ***Calluna* height**: 11-20cm
- ***Cladonia* cover**: absent
- **Macro-topography**: flat
- **Pools**: a single large pool/lawn covers much of the active flush
- ***Sphagnum* cover**: 51-75%
- ***Narthecium* cover**: 5-10%
- **Micro-topography:** low hummocks/pool/lawn
- **Tussocks:** absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Sphagnum capillifolium* (11-25%), *S. cuspidatum* (34-50%), *S. papillosum* (11-25%), *S. magellanicum* (11-25%), *Calluna vulgaris* (11-25%), *Narthecium ossifragum* (5-10%), *Eriophorum angustifolium* (5-10%).
- **Additional comments**: This small active zone, in the south of flush **Z**, was previously delineated by only two individual mapping points (Fernandez *et al*., 2005), but was accurately mapped here with a series of boundary mapping points. The active flush zone may have been

more extensive before the recent burn event, which has severely damaged the western side of this area. All tall *Calluna vulgaris* was burnt, with most regenerating material now up to only c.15cm tall.

The active flush contains a large shallow pool/lawn with a high cover of *S. cuspidatum* and smaller patches of *S. magellanicum*. Small hummocks of *Aulacomnium palustre* were present around the pool edge and dotted through the pool/lawn. *Sphagnum* hummocks around the edge of the pool were largely composed of *S. capillifolium*, while *S. papillosum* hummocks and *Eriophorum angustifolium* were common around lawns. *Pleurozium schreberi* and *Vaccinium oxycoccos* were also present on hummocks, while *Molinia caerulea* was present, though sparsely so, throughout.

FLUSH W

Flush W is a newly recorded active flush in old cutover at the southeastern extreme of the site. Its inclusion now is likely to be the result of more comprehensive surveying in 2012 which resulted in more accurate mapping. However, as the flush is located in an old cutover area, it may have developed in the reporting period.

Degraded Raised Bog (7120)

Sub-Marginal Ecotope Complexes

COMPLEX 9/7/6

- **Location**: the most widespread sub-marginal ecotope community complex at the site
- **Ground**: soft
- **Physical indicators**: recent burn damage: bare peat 5%, *Calluna* stems dead, charred
- ***Calluna* height**: 11-25%
- ***Cladonia* cover**: <1%
- **Macro-topography**: gentle slope to south
- **Pools**: absent (small, regular pools, 5% cover, in 9/7/6+P (below))
- ***Sphagnum* cover**: 11-25%
- ***Narthecium* cover**: 11-25%
- **Micro-topography:** low hummocks/hollows/tear pools
- **Tussocks:** absent
- **Degradation or regeneration evidence**: absent

- **Species cover**: *Sphagnum capillifolium* (11-25%), *S. cuspidatum* (1-4%), *S. papillosum* (1-4%), *S. fuscum* (1-4%), *S. austinii* (1-4%), *Calluna vulgaris* (11-25%), *Eriophorum vaginatum* (11-25%), *E. angustifolium* (11-25%), *Erica tetralix* (1-4%), *Carex panicea* (1-4%), *Trichophorum germanicum* (1-4%),
- **Additional comments**: Extensive burn damage observed in the complex, most obviously in the form of dead, charred *Calluna* stems; dead *Sphagnum* on hummocks, and charred tussocks.
  - Variant 1: 9/7/6+P: Where pools were found in the community complex type that was similar in all other respects to 9/7/6, it was described as 9/7/6+P (Pools). These pools were small, regular pools, covering approximately 10% of the complex area, with a generally good cover of *S. cuspidatum*. *Menyanthes trifoliata* and *Eriophorum angustifolium* were also present in pools, while *S. papillosum* was common at the edges of pools. This complex was mapped in **Sc2**, a small sub-central zone adjacent to flush **Z**. Pools covered an estimated 20% of this area, while overall *Sphagnum* cover was approximately 30%. **Sc6**, a previously unmapped sub-central ecotope zone in the west side of lobe 1, was also comprised of 9/7/6+P.
  - Variant 2: 9/7/6+My (*Myrica*): Mapped in the northern part of lobe 3, this complex, which differed substantially from 9/7/6 only in the occurrence of *Myrica gale* at ≥5%, was part of an area that had seen relatively severe burn damage. An assessment of this area during the field survey concluded that it may have been sub-central ecotope prior to the burn episode, such was the extensive damage to *Sphagnum* hummocks, which were now excluded from the estimation of total *Sphagnum* cover.
  - Variant 3: 9a/7/6: Similar to 9/7/6, but differing in that *Eriophorum angustifolium* was more common than *E. vaginatum* and was characteristic of the complex. The ground was soft within the complex and the estimated total *Sphagnum* cover of 26-33% exceeded that of 9/7/6.
  - Variant 4: 9a/7/6+My (*Myrica*): Similar to 9a/7/6, but with *Myrica gale* at 10-15% cover. Some of the taller *Myrica* in this complex variant had been burnt in the recent fire.
  - Variant 5: 9a/7/6+Ph(B) (*Phragmites*, burnt): found to the west of **Sc6**, Similar to 9a/7/6, but with *Phragmites australis* present at 1-4% cover and burn damage from recent fire. Total *Sphagnum* cover of 26-33% mostly consisted of *S. capillifolium* hummocks.
  - Variant 6: 9/7/3: Similar to 9/7/6, but differing in that *Carex panicea* was more common, and replaced *Narthecium ossifragum* as one of the species that was characteristic of the complex. Where the sub-marginal 9/7/6 and 9/7/3 were mapped in the south-west corner of lobe 4, there were some parts which, due to a locally high cover of *Sphagnum* – consisting mostly of

hummocks of *S. capillifolium*, *S. papillosum*, and *S. subnitens*, were borderline sub-central (potentially complex 9/7/10), but were retained as sub-marginal, due, at least in part, to the high cover of *Carex panicea* there.

The complex 9/7/6 +TP (Tear Pools) was used for sub-central ecotope and is fully described above.

COMPLEX 6/3+TP (TEAR POOLS)

- **Location**: found within lobes 1 and 4
- **Ground**: soft
- **Physical indicators**: moderate to severe burn damage: all tall *Calluna* dead, *Sphagnum* hummocks damaged, charred tussocks
- ***Calluna* height**: 0-10cm
- ***Cladonia* cover**: absent
- **Macro-topography**: gentle slope to north
- **Pools**: tears, mostly East-West orientation
- ***Sphagnum* cover**: 26-33%
- ***Narthecium* cover**: 26-33%
- **Micro-topography:** low hummocks/hollows/pools
- **Tussocks:** *Trichophorum germanicum* (<1%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Sphagnum capillifolium* (11-25%), *S. cuspidatum* (5-10%), *S. papillosum* (5-10%), *S. tenellum* (1-4%), *S. subnitens* (1-4%), *Narthecium ossifragum* (5-10%), *Calluna vulgaris* (5-10%), *Carex panicea* (11-25%), *Eriophorum vaginatum* (11-25%), *Campylopus atrovirens* (1-4%).
- **Additional comments**: Tear pools were up to 5m x 1m, and were generally east-west orientated. The interpool areas in the complex were somewhat variable in quality, with some of the drier parts dominated by *Narthecium ossifragum* and *Carex panicea*, and *Sphagnum* cover low.

Marginal Ecotope Complexes

COMPLEX 9A/3

- **Location**: west of lobe 2, southeast of lobe 4
- **Ground**: firm
- **Physical indicators**: bare peat 20%; burnt, dead *Calluna* stems

- ***Calluna* height**: 0-10cm
- ***Cladonia* cover**: absent
- **Macro-topography**: gentle slope to north-east
- **Pools**: absent
- ***Sphagnum* cover**: 1-4% (c. 1%)
- ***Narthecium* cover**: 5-10%
- **Micro-topography:** flat
- **Tussocks:** *Eriophorum vaginatum* (5%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *S. papillosum* (<1%), *S. tenellum* (<1%), *Eriophorum angustifolium* (34-50%), *E. vaginatum* (11-25%), *Carex panicea* (11-25%), *Calluna vulgaris* (11-25%), *Myrica gale* (5-10%), *Trichophorum germanicum* (1-4%).
- **Additional comments**: The ground in this complex, adjacent to an old cutover area, was quite wet, although firm underfoot and almost totally devoid of *Sphagnum*.

COMPLEX 3/6 (B) (BURNT)

- **Location**: this is the most widespread marginal ecotope community complex at the site
- **Ground**: firm to slightly soft
- **Physical indicators**: recent burn damage: tall *Calluna* stems dead and charred; bare peat 5-10%
- ***Calluna* height**: 0-10cm
- ***Cladonia* cover**: <1%
- **Macro-topography**: gentle slope to south
- **Pools**: tear pools 1-5%
- ***Sphagnum* cover**: 5-10%
- ***Narthecium* cover**: 11-25%
- **Micro-topography:** low hummocks/hollows/small tear pools
- **Tussocks:** *Trichophorum germanicum* 1-5%
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Sphagnum capillifolium* (5-10%), *S. cuspidatum* (5-10%), *S. fuscum* (<1%), *S. austinii* (<1%), *S. papillosum* (<1%), *Calluna vulgaris* (26-33%) *Trichophorum germanicum* (1-5%), *Narthecium ossifragum* (11-25%), *Carex panicea* (11-25%), *Eriophorum vaginatum* (5-10%), *E. angustifolium* (1-4%), *Erica tetralix* (1-4%), *Leucobryum glaucum* (<1%); *Pedicularis* sp. (<1%).

- **Additional comments**: The effects of recent burn damage, most obviously in the form of dead, charred *Calluna* stems and burnt, dead *Sphagnum* in hummocks, were widespread in this complex.
    - Variant 1: 3/6+TP (Tear Pools): Where Tear pools were present, the complex was assigned to 3/6+TP (Tear Pools). These pools generally had good cover of *S. cuspidatum*, with *S. denticulatum* also recorded, but the interpool areas had total *Sphagnum* cover of <10%. *Campylopus atrovirens* was present, but rare, at pool edges. Burn damage, similar to that recorded in complex 3/6, was also noted in this complex variant, although there was an area of 3/6+TP in the east side of the site, that had not been burnt. *Cladonia portentosa* was present here at c. 15% cover, and *Calluna* height was in the range of 30-40cm.
    - Variant 2: 3/6/2: Initially mapped in the southern part of lobe 3, this variant of 3/6 had *Trichophorum germanicum* at c. 15% cover.
    - Variant 3: 3/6+My (Myrica): This variant of 3/6, mapped in the north-east of lobe 1, reflected a significant cover of *Myrica gale* (generally 5-10%), in a community complex that was not otherwise substantially different from 3/6.

Inactive flushes

FLUSH X

- **Location**: northern part of bog (northern end of lobe 1)
- **Ground**: firm
- **Physical indicators**: moderate burn damage: dead *Sphagnum* on hummocks, dead stems on shrubs
- ***Calluna* height**: 11-25cm
- ***Cladonia* cover**: 5-10%
- **Macro-topography**: moderately steep slope to north
- **Pools**: absent
- ***Sphagnum* cover**: 11-25%
- ***Narthecium* cover**: 11-25%
- **Micro-topography:** low hummocks
- **Tussocks:** absent
- **Degradation or regeneration evidence**: absent

- **Species cover**: *Sphagnum capillifolium* (11-25%), *S. papillosum* (1-4%), *Calluna vulgaris* (11-25%), *Molinia caerulea* (26-33%), *Myrica gale* (5-10%), *Narthecium ossifragum* (5-10%), *Eriophorum vaginatum* (5-10%), *Potentilla erecta* (1-4%).
- **Additional comments**: There were occasional isolated patches in flush **X** where *Sphagnum* cover was up to 75%, but these were generally not big enough to warrant mapping as active flush. The northern part of this flush was dominated by *Molinia caerulea*, with *Myrica gale* uncommon. With the exception being these typical flush species, the flush was otherwise similar to the 9/7/6 sub-marginal community complex, with *Calluna vulgaris*, *Eriophorum vaginatum* and *Narthecium ossifragum* all common and characteristic of the area. Flush **X** was closely associated with cutover peat and associated drains in the north/north-east of the bog, and the currently functional nature of drains here (with flowing water observed in some) presents obvious possibilities for the re-wetting of adjacent degraded bog through drain blocking.

FLUSH Y

- **Location**: in the narrow central part of the bog, between lobes 1&2
- **Ground**: firm
- **Physical indicators**: severe burn damage: dead and charred shrub stems; much of *Sphagnum* in hummocks dead; bare peat 5-10%
- ***Calluna* height**: 10-20cm
- ***Cladonia* cover**: absent
- **Macro-topography**: slope to north-east
- **Pools**: 1-2%
- ***Sphagnum* cover**: 20%
- ***Narthecium* cover**: absent
- **Micro-topography:** low hummocks/hollows/high hummocks
- **Tussocks:** *Molinia caerulea* 5%
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Molinia caerulea* (33-50%), *Calluna vulgaris* (26-33%), *Myrica gale* (5-10%), *Eriophorum vaginatum* (11-25%), *Sphagnum capillifolium* (11-25%), *S. cuspidatum* (1-4%), *S. fallax* (<1%).
- **Additional comments**: This flush was dominated by *Molinia caerulea*, which may in part be due to the recent burning of much tall *Calluna vulgaris*, which could otherwise have been at least co-dominant. High hummocks within the flush were severely fire-damaged and mostly

destroyed. The *Sphagnum* cover of 20% includes much fire-damaged material. The current cover of living and healthy *Sphagnum* is somewhat less than 20%. Pools contained *S. cuspidatum* and the uncommon *S. fallax.*

FLUSH Z

- **Location**: north end of lobe 1
- **Ground**: firm
- **Physical indicators**: burn damage: dead tall *Calluna* and *Myrica* stems; damage to hummocks often severe
- ***Calluna* height**: 11-20cm
- ***Cladonia* cover**: 1-4%
- **Macro-topography**: flat
- **Pools**: absent
- ***Sphagnum* cover**: 5-10%
- ***Narthecium* cover**: 5-10%
- **Micro-topography:** flat
- **Tussocks:** *Molinia* caerulea
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Molinia caerulea* (34-50%), (*Sphagnum capillifolium* (5-10%), *Calluna vulgaris* (11-25%), *Myrica gale* (5-10%), *Narthecium ossifragum* (5-10%), *Eriophorum vaginatum* (11-25%), *Eriophorum angustifolium* (1-4%), *Potentilla erecta* (1-4%), *Succisa pratensis* (1-4%), *Leucobryum glaucum* (<1%), *Pedicularis* sp. (1-4%).
- **Additional comments**: This inactive flush was dominated by *Molinia caerulea*, with *Myrica gale* and small hummocks of *S. capillifolium* also common. Burn damage, manifested as dead and charred *Calluna* and *Myrica* stems, and severely burned *Sphagnum* hummocks, was widespread in the flush. Dead *Calluna* stems were up to approximately 0.75m tall in the east side of the flush. The flush was quite narrow and extended east-west across the bog, along a deep drain that was originally part of the natural channel through the flush. In the western end of the flush, where the drain was no longer visible, there were a number of swallow holes, some of which had a strong inflow of water. The banks of the drain had occasional *Betula pubescens* and *Ulex europaeus*. *Succisa pratensis* and *Rubus fruticosus* were also recorded also the sides of the drain.

Face bank Complexes

COMPLEX 1

- **Location**: described in the north-east of the bog; present intermittently around the margin of the bog
- **Ground**: firm
- **Physical indicators**: absent
- ***Calluna* height**: 21-40cm
- ***Cladonia* cover**: 5-10%
- **Macro-topography**: steep slope to bog margin
- **Pools**: absent
- ***Sphagnum* cover**: <1%
- ***Narthecium* cover**: absent
- **Micro-topography:** tall *Calluna vulgaris*
- **Tussocks:** absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (76-90%), *Sphagnum capillifolium* (1-4%), *Erica tetralix* (1-4%), *Hypnum jutlandicum* (1-4%), *Trichophorum germanicum* (<1%).
- **Additional comments**: none

Depressions on peat substrates of the Rhynchosporion (7150)

The habitat occurs at Flughany in both Active and Degraded Raised Bog, but is found only occasionally in degraded habitat.

R. alba is found in all ecotopes in Flughany Bog, such as: central ecotope (35); sub-central ecotope (9a/10; 6+P; 9/7/6+TP); sub-marginal ecotope (9/7/6 (including several associated variants of this complex); 6/3+TP), marginal ecotope (9a/3; 3/6 (B) (including associated variants of this complex)) face bank ecotope (1) and active flushes.

The species becomes most frequent within complex 35 (central), although there were no complexes at the site where it could be said to form a characteristic element of the vegetation.

R. fusca was found in the sub-central complex 9/7/6+TP

The species are 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, and in more degraded areas of the bog, particularly where tear pools or erosion channels were found.

Appendix II Photographical records

Photograph Number	Aspect	Type	Feature	Date
DSCF3590	NE	Overview	Qsc3	16/10/2012
DSCF3591	NE	Overview	Qc1	17/10/2012
DSCF3592	NE	Overview	Qsc2	17/10/2012

Appendix III Quadrats

Ecotope type	**Central**	**Central**	**Sub-central**	**Sub-central**
Complex Name	**4/35**	**35**	**4/9 +P**	**6+P**
Quadrat Name	Qc1	Qc1	Qsc2	QSc2
Easting	161309	161315.48	161396	161390.67
Northing	306048	306046.39	306023	306024.03
Date	06/04/2005	17/10/2012	06/04/2005	17/10/2012
Firmness	Soft	Very soft	very soft	Very soft
Burnt	No	Light	No	Severe
Algae in hollows %	1-3 (many indiv)	Absent	1-3 (many indiv)	Absent
Algae in pools %	4-10	Absent	1-3 (many indiv)	1-3 (many indiv)
Bare peat %	4-10	1-3 (many indiv)	1-3 (many indiv)	1-3 (many indiv)
High hummocks %	Na	Absent	na	Absent
Low hummocks %	11-25	26-33	11-25	26-33
Hollows %	26-33	4-10	34-50	4-10
Lawns %	Absent	Absent	Absent	4-10
Pools %	26-33	34-50	4-10	11-25
Pool type	Interconnecting	Interconnecting	Regular	Interconnecting
S.austinii hum type	Na	Absent	na	Relic
S.austinii hum %	1-3 (many indiv)	Absent	1-3 (many indiv)	1-3 (many indiv)
S.austinii height(cm)	Na	Absent	na	11-20
S.fuscum hum type	Na	Absent	na	Absent
S.fuscum hum %	Absent	Absent	na	Absent
S.fuscum height(cm)	Na	Absent	na	Absent
Leucobryum glaucum	Absent	Absent	na	Absent

Ecotope type	**Central**	**Central**	**Sub-central**	**Sub-central**
Complex Name	**4/35**	**35**	**4/9 +P**	**6+P**
Trichophorum type	Tussocks	Flats	Absent	Absent
Trichophorum %	1-3 (many indiv)	1-3 (few indiv)	Absent	Absent
S.magellanicum %	Absent	Absent	Absent	Absent
S.cuspidatum %	11-25	26-33	1-3 (many indiv)	4-10
S.papillosum %	4-10	11-25	4-10	11-25
S.denticulatum %	4-10	Absent	1-3 (many indiv)	Absent
S.capillifolium%	11-25	26-33	4-10	11-25
S.tenellum %	Na	1-3 (many indiv)	na	1-3 (several indiv)
S.subnitens %	Na	1-3 (many indiv)	na	Absent
R.fusca %	Na	Absent	na	Absent
R.alba %	11-25	1-3 (several indiv)	4-10	Absent
N.ossifragum %	1-3 (many indiv)	11-25	4-10	4-10
Sphag pools %	11-25	26-33	4-10	4-10
Dominant pool Sphag	S.cuspidatum	S.cuspidatum	S.cuspidatum	S.cuspidatum
Sphag lawns %	Absent	Absent	Absent	4-10
Sphag humm %	11-25	26-33	11-25	26-33
Sphag holl %	11-25	1-3 (many indiv)	11-25	1-3 (many indiv)
Total Sphag %	34-50	51-75	11-25	34-50
Hummocks indicators	S.austinii	S.fuscum	S.austinii	S.austinii
Cladonia portent %	4-10	1-3 (several indiv)	4-10	Absent
Other Cladonia sp	Na	C. uncialis (burn damaged)	na	C. uncialis (burnt)
C. panicea %	na	Absent	na	1-3 (several indiv)
Calluna cover %	11-25	11-25	11-25	11-25
Calluna height(cm)	21-30	11-20	21-30	11-20
Other NotableSpecies		Campylopus atrovirens; Drosera anglica;	Racomitrium lanuginosum	Racomitrium lanuginosum; Pedicularis sp.;

Ecotope type	**Central**	**Central**	**Sub-central**	**Sub-central**
Complex Name	**4/35**	**35**	**4/9 +P**	**6+P**
				Hypnum jutlandicum; Eriophorum angustifolium 10%
Other comment		Rhynchospora alba nearly gone; more Sphagnum (location?)		Rhynchospora alba gone; more Sphagnum (location)

Ecotope type	**Subcentral**	**Sub-central**
Complex Name	**9/3 +TP**	**9/7/6+P**
Quadrat Name	Qsc3	Qsc3
Easting	161997	161998.23
Northing	307323	307326.77
Date	06/04/2005	16/10/2012
Firmness	firm-soft	Very soft
Burnt	No	Light
Algae in hollows %	Absent	Absent
Algae in pools %	Absent	Absent
Bare peat %	Absent	1-3 (many indiv)
High hummocks %	Na	Absent
Low hummocks %	4-10	34-50
Hollows %	11-25	1-3 (many indiv)
Lawns %	4-10	Absent
Pools %	34-50	11-25
Pool type	Tear	Tear
S.austinii hum type	Na	Absent
S.austinii hum %	Absent	Absent
S.austinii height(cm)	Na	Absent

Ecotope type	**Subcentral**	**Sub-central**
Complex Name	**9/3 +TP**	**9/7/6+P**
S.fuscum hum type	Na	Absent
S.fuscum hum %	Absent	Absent
S.fuscum height(cm)	Na	Absent
Leucobryum glaucum	Absent	Absent
Trichophorum type	Tussocks	Flats
Trichophorum %	4-10	1-3 (many indiv)
S.magellanicum %	Absent	Absent
S.cuspidatum %	11-25	11-25
S.papillosum %	4-10	4-10
S.denticulatum %	1-3 (many indiv)	Absent
S.capillifolium%	4-10	11-25
S.tenellum %	Na	1-3 (many indiv)
S.subnitens %	Absent	1-3 (many indiv)
R.fusca %	Absent	Absent
R.alba %	4-10	Absent
N.ossifragum %	1-3 (many indiv)	11-25
Sphag pools %	26-33	11-25
Dominant pool Sphag	S.cuspidatum	S.cuspidatum
Sphag lawns %	4-10	Absent
Sphag humm %	4-10	34-50
Sphag holl %	11-25	1-3 (few indiv)
Total Sphag %	34-50	51-75
Hummocks indicators	Absent	Absent
Cladonia portent %	4-10	Absent
Other Cladonia sp	Na	no
C. panicea %	Na	1-3 (several indiv)

Ecotope type	**Subcentral**	**Sub-central**
Complex Name	**9/3 +TP**	**9/7/6+P**
Calluna cover %	Na	11-25
Calluna height(cm)	21-30	11-20
Other NotableSpecies		Drosera anglica; Menyanthes trifoliata
Other comment		Narthecium ossifragum cover higher here; S. denticulatum absent here

Note: Data for those 2005 quadrats re-surveyed in 2012 is given to the right of the original 2005 quadrat data in table above. Not all quadrats reported in 2005 were re-surveyed in 2012. Nonetheless, all 2005 quadrat data is given above. Additional quadrats were recorded where necessary. Some 2005 quadrats may have been classified under a different ecotope category in 2012; further detail is given within the report.

Appendix IV Survey maps

160400 000000 | 161300 000000 | 162200 000000

307400 000000 | 306800 000000 | 306200 000000

X
Y
Z
Sc1
Sc2
Sc3
Sc4
Sc5
Sc6
C1
C2
C3
Qc1
Qsc2
Qsc3
W

Raised Bog Monitoring & Assessment Survey 2013

Map 1: Ecotopes Map and Quadrats

Ecology and Environmental Consultants Ireland Ltd.

Flughany SAC (000497)
Co. Mayo/Co. sligo

1:8,500

N

0 105 210 420 630 840 Meters

Legend

- Quadrat
- **Ecotope type**
  - Central
  - Sub-central
  - Bog Woodland
  - Active Flush
  - Sub-marginal
  - Marginal
  - Inactive Flush
  - Woodland
  - Face bank
  - Open water
  - Conifer plantation
  - Clear felled area
  - SAC

160400 000000 | 161300 000000 | 162200 000000

307400 000000 | 306800 000000 | 306200 000000

Raised Bog Monitoring & Assessment Survey 2013

Map 2: Vegetation community complexes

Ecology and Environmental Consultants Ireland Ltd.

Flughany SAC (000497)
Co. Mayo/Co. Sligo

1:8,500

N

0 120 240 480 720 960 Meters

Legend

Ecotope type

- Central ecotope complex
- Sub-central ecotope complex
- Sub-marginal ecotope complex
- Marginal ecotope complex
- Face bank ecotope complex

Boundary type

Flush | F/SC | SM/FB
SC/C | SM/SC | F/M
F/C | FB/SC | M/SC | M/FB | F/FB
SM/C | F/SM | Other
M/C | M/SM | SAC

160400 000000 | 161300 000000 | 162200 000000

307400 000000 | 306800 000000 | 306200 000000

Raised Bog Monitoring & Assessment Survey 2013

Map 3: Impacts (High bog drainage; Turf cutting;Fire events)

Ecology and Environmental Consultants Ireland Ltd.

Flughany SAC (000497)
Co. Mayo/Co. Sligo

1:8,500

N

0 110 220 440 660 880 Meters

Legend

High Bog drainage

- Not blocked:functional
- Blocked:non-functional
- Not blocked:non-functional
- Blocked:reduced functional
- Not blocked:reduced functional

SAC

Burnt high bog (2004/05-12/13)

High bog cutaway (2004/05-10)