Bellanagare Bog (SAC 000592), Co. Roscommon

Executive Summary

This survey, carried out in February 2013, aimed to assess the conservation status of habitats listed on Annex I of the European Habitats Directive (92/43EEC) on the high bog at Bellanagare 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 49.59ha (5.64%) of the high bog area. Two small areas (totalling 0.36ha) of central ecotope are present in lobe five of the high bog and these feature interconnecting *Sphagnum* pools, lawns and hummocks. Pools cover up to 50% of these areas with the *Sphagnum* cover approximately 50% composed mostly of *S. cuspidatum* in pools, but also with *S. denticulatum* in pools, *S. papillosum* in lawns, and *S. austinii* and *S. capillifolium* in hummocks. The western indicators *Campylopus atrovirens* and *Racomitrium lanuginosum* are also present. High quality Active Raised Bog is also present in the form of active flush, particularly flush W2 on lobe 7, which is essentially an infilling lake or soak where the *Sphagnum* cover is 76-90%. Sub-central ecotope is also present (38.27ha) and is more variable in quality with the *Sphagnum* cover ranging from 34 to 75%.

Degraded Raised Bog covers 829.28ha (94.36%) of the high bog area. It is drier than Active Raised Bog and supports a lower density of *Sphagnum* mosses (generally less than 25% cover). It has a less developed micro-topography while permanent pools and *Sphagnum* lawns are generally absent. The habitat also includes some inactive flushes.

Depressions on peat substrates of the Rhynchosporion are found in both Active and Degraded Raised Bog, but tend to be best developed and most stable in the wettest areas of Active Raised Bog. On this site it was most frequent in the sub-central community complexes 6/4 + P, 4/10 and 9/7/4 + P and only *Rhynchospora alba* was recorded.

Restoration works took place at the site in 1996-97 including the blocking of some high bog drainage complexes in the north of the site. However, no restoration works took place during the reporting period and furthermore some of the previously blocked drains were re-opened.

The current conservation objective for Bellanagare 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 239.77ha. 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 to peat extraction 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 a decrease (3.21ha) in the area of Active Raised Bog at Bellanagare Bog in the 2004 to 2013 period. Most of this loss has been from sub-central ecotope (3.11ha; 1.25ha from former **Sc10** on lobe1; 0.85ha from **Sc1** on lobe 7; 0.5ha from **Sc3** and 0.35ha from **Sc5** on lobe 6; 0.66ha from former **Sc13** on lobe 10 and 0.5ha from **Sc11** on lobe 4) with a 0.10ha of active flush lost (from **Z** on lobe 8). The gross decrease recorded in extent was actually higher (4.36ha), but this was balanced somewhat by small (1.15ha) expansions of ARB in **Sc1** on lobe7 and **Sc2** on lobe 5 brought about by the blocking and/or infilling of drains. There have also been some changes to the distribution of the habitat with several new peat forming areas described at the site, which are the result of the 2013 survey being more comprehensive than previous ones rather than actual changes on the ground.

Peat cutting and drainage are the most threatening current activities at the site. At least 5.77ha of high bog have been lost in the reporting period due to peat cutting and 34 plots were recorded as being actively cut in 2010/11 (102 were cut in the 2005-2010 period). The activity has continued in 2013. Over 11km of drains on the high bog remain unblocked and functional and a further 13km reduced functional. Furthermore, over 1km of blocked drains are still considered as functional and over 34km considered reduced functional. Cutover drains are also extensive and there are also four

small separate blocks (totalling 9.5ha) of conifer plantations on the high bog as well as 132ha of plantations on the cutover.

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

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

The **overall raised bog** at **Bellanagare 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 the cutover including the blocking of functional and reduced functional drains and the removal of conifer plantations; further hydrological and topographical studies to ascertain more accurate FRVs; and further botanical monitoring surveys.

Site identification

SAC Site Code	000592	**6" Sheet:**	RN 15/1
Grid Reference:	E 172100 / N 287000	**1:50,000 Sheet:**	32 & 33
High Bog area (ha):	878.9ha [1]		
Dates of Visit:	11 to 14/02/13 and 18 to 21/02/13		
Townlands:	Mullen, Derreen, Cornamucklagh, Falmore, Arraghan, Lugakeeran, Tully, Bracldoon, Cloonsheever, Cloonfinglas and Leitrim.		

[1] The current extent of the high bog is 878.9ha, while that reported in 2004 was 852.81ha (Fernandez *et al*., 2005). This discrepancy is the result of more accurate mapping of the high bog edge by using the higher resolution 2010 aerial images compared to those used in 2004, rather than any actual increase in high bog extent. High bog area has in fact decreased in the 2004-2012 period due to peat cutting. The actual high bog extent in 2004 was 884.67ha (see tables 8.1 and 8.3 2004 (amended) figures).

Site location

Bellanagare Bog is located between the towns of Frenchpark, Bellanagare and Castlerea in Co. Roscommon. The road (R361) between Frenchpark and Castlerea runs along the west of the bog. Another road runs to the south and there are various roads to the east and north. Kelly *et al*. (1995) grouped Bellanagare Bog with the raised bogs of NE Galway/NW Roscommon. Cloonchambers Bog (SAC 000600) is located 8km to the southwest of Bellanagare SAC and Cloonshanvile (SAC 0000614) 4km to the northeast.

Access to the site can be obtained from a number of points. The north of the site can be accessed from a bog road which extends directly west into Lobe 10 (see Fernandez *et al*. (2005)) of the bog from the Bellanagare to Frenchpark road (N5). The west of the site can be accessed from the main Frenchpark to Castlerea road (R361) while the east of the site can be accessed from a bog road that extends into the site between Lobe 1 and Lobe 6. The south-west of the site can be accessed from a forestry road that extends along the southern boundary of Lobe 3 and the south-east can be accessed from a bog road that extends north into Lobe 2 from a road that runs along the southern perimeter of the site in a WNW/ESE direction.

Description of the survey

The survey was carried out in February 2013 and involved a vegetation survey of the high bog at Bellanagare Bog and the recording of impacting activities affecting high bog vegetation. A similar survey was carried out in 2004 by Fernandez *et al*. (2005). High bog vegetation was described and mapped, based on raised bog ecotope vegetation community complexes developed by Kelly and Schouten (2002). Detailed notes were taken on each community complex and any flushed areas that were present. These included: species lists; estimation of % cover of dominant species; percentage *Sphagnum* cover; evidence of damage (due to burning, peat cutting or drainage); micro-topography; ground firmness; and presence of *Cladonia* species. A list of photographical records is given in Appendix II. The survey aimed to assess the conservation status of Habitats Directive (Council Directive 92/43/EEC) Annex I habitats on the high bog.

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

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

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

Description of the high bog

According to Kelly *et al.* (1995) Bellanagare is considered to be the largest remaining example of a relatively intact raised bog system in Ireland. This bog is considered somewhat unusual in that it has a surface morphology intermediate between that of a raised bog and blanket bog. Midland

raised bog indicator species such as *Andromeda polifolia* and *Sphagnum magellanicum* are present. However they are not as common as in a true midland raised bog. Kelly *et al.* (1995) considered Bellanagare as a good example of a western raised bog, due to its large size and intactness. A large number of flushes occur on the site in areas of surface water movement due to the unusual undulating topography of the bog surface.

It is an elongate site extended in a N-S direction with a complex shape. Peat cutting has occurred around all the lobes with a large area being cut from the mid-east. The high bog was divided in 10 lobes by Fernandez *et al*. (2005) to facilitate the description of the high bog vegetation and refer the location of the different features described within this report to details (see maps 1-3). As a result of peat cutting lobes 1, 2 & 3 at the south of the bog are practically detached from the rest of the high bog.

Ecological Information

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

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

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

Active Raised Bog (7110)

The current area of Active Raised Bog at Bellanagare Bog is 49.59ha (5.64% of the high bog), which is a decrease of 42.27ha since 1994.

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

The highest quality Active Raised Bog at Bellanagare was found in the form of two small areas of central ecotope (complex 35) on lobe five and a small active flush (**W2**), essentially an infilling lake or soak on lobe seven (see Appendix IV, Map 1). The two small areas of central ecotope (totalling 0.36ha) featured interconnecting *Sphagnum* pools, lawns and hummocks. Pools covered 26 to 50% of these areas with the *Sphagnum* cover approximately 50% composed mostly of *S. cuspidatum* in pools, but also with *S. denticulatum* in pools, *S. papillosum* in lawns, and *S. austinii* and *S. capillifolium* in hummocks. The western indicators *Campylopus atrovirens* and *Racomitrium lanuginosum* were also

present. *Calluna vulgaris*, *Eriophorum vaginatum*, *E. angustifolium* and *Rhynchospora alba* were the most dominant vascular plants. The active flush, **W2** (0.3ha) was very wet and quaking and had an even higher *Sphagnum* cover (76-90%) again composed mostly of *S. cuspidatum* with *S. papillosum*, *S. magellanicum* and *S. pulchrum* present in lawns around the pool margin. Hummocks of *S. capillifolium* and tall *Calluna vulgaris* were sparsely scattered throughout the flush while *Eriophorum angustifolium* was common throughout the quaking pool and *Aulacomnium palustre* was abundant in places.

The remaining areas of ARB are summarised here by the lobe within which they were found:

Lobe one supported a relatively large area (8.47ha) of active flush (**Y4**). However, this was not of the highest quality and was in fact more similar to poor quality sub-central ecotope. There were no pools present with the micro-topography dominated by hummocks and hollows and even though there was a relatively high *Sphagnum* cover (averaging at ca. 50% cover), it was composed mostly of hummocks of *S. capillifolium* with only occasional *S. tenellum*, *S. papillosum* and *S. cuspidatum*. *Calluna vulgaris* and *Eriophorum vaginatum* were by far the most dominant vascular plants and evidence of flushing was indicated by the presence of *Empetrum nigrum*, *Vaccinium oxycoccos*, *V. myrtillus*, *Aulacomnium palustre*, *Dicranum scoparium*, *Polytrichum strictum*, *Pleurozium schreberi* and *Hylocomium splendens*.

Lobe two supported two small areas (0.69ha) of sub-central ecotope, **Sc15** and **Sc16**, which were dominated by complex 6/4 + P. Pools covered 11-25% of the surface area and the overall *Sphagnum* cover was 34-50%. *Calluna vulgaris*, *Rhynchospora alba*, *Narthecium ossifragum* and *Eriophorum angustifolium* were the most dominant vascular plants while *S. papillosum* and *S. cuspidatum* dominated the *Sphagna* layer with *S. pulchrum*, *S. magellanicum* and *S. denticulatum* also present as well as hummocks of *S. capillifolium* and active hummocks of *S. austinii* and the western indicator *Campylopus atrovirens*. The cover of *Cladonia portentosa* was very low (<4%).

Lobe three supported three small areas (0.39ha) of sub-central ecotope, **Sc14**, **Sc19** and **Sc20**. **Sc14** was dominated by complex 6/4 + P, which is summarised under lobe one above. However, here there was a higher cover of *Cladonia portentosa* (up to 25% cover) and *Eriophorum vaginatum* and a lower cover of *E. angustifolium*. *Racomitrium lanuginosum*, *Drosera anglica* and *Sphagnum fuscum* were also recorded. Sc19 was dominated by complex 6/9A + P, which had an interconnecting pool cover of ca. 30% and an overall *Sphagnum* cover of 51-75% dominated by *S. cuspidatum* in pools and *S. capillifolium* in hummocks with *S. papillosum* and *S. magellanicum* also present. *Calluna vulgaris* and *Eriophorum angustifolium* were the most dominant vascular plants although *Narthecium ossifragum* and *Carex panicea* were dominated in poorer quality patches. The cover of *Cladonia portentosa* was

26-33%. **Sc20** was the poorest quality sub-central ecotope recorded in lobe three and was dominated by complex 9/7 + P, and considered an area of borderline sub-marginal/sub-central ecotope. The pools, which covered approximately 10% of the surface area appeared to have dried out somewhat so that they are more like *Sphagnum*-filled depressions that graded into *Narthecium* dominated depressions where the complex graded into sub-marginal ecotope. The overall *Sphagnum* cover was estimated at 30% composed mostly of hummocks of *S. capillifolium* and *S. papillosum* with *S. cuspidatum* in pools and with *S. magellanicum* and relic hummocks of *S. austinii* also present. *Calluna vulgaris* and *Eriophorum vaginatum* were the most dominant vascular plants although *Narthecium ossifragum* and *Carex panicea* were frequent in poorer quality patches. The western indicator *Racomitrium lanuginosum* was also recorded and the cover of *Cladonia portentosa* was high (34-50%).

Lobe four supported only one area (1.39ha) of ARB (**Sc11**). This was dominated by complex 9/7 + P, and considered an area of borderline sub-marginal/sub-central ecotope. This complex is summarised under lobe three above, but here had a slightly higher pool and *Sphagnum* cover and a lower cover of *Cladonia portentosa* (ca. 5%). *Eriophorum angustifolium* and *Sphagnum papillosum* were also more prominent and *S. denticulatum* and *Drosera anglica* were present.

Lobe five supported a large area (15.86ha) of sub-central ecotope (**Sc2**) as well as the two small areas of central ecotope summarised above. **Sc2** was dominated by complex 6/4 + P although small areas in the west were dominated by the poorer quality complex 9/7 + P.

Lobe six supported four small areas (totalling 1.17ha) of sub-central ecotope, **Sc3**, **Sc4**, **Sc5** and **Sc18**. **Sc3**, **Sc4** and **Sc18** were dominated by complex 9/7/4 + P, which had a pool cover of 10-20% and an overall *Sphagnum* cover of ca. 50% composed mostly of *Sphagnum papillosum* and *S. cuspidatum* with *S. tenellum*, *S. austinii* and *S. capillifolium* also present. The western indicators *Pleurozia purpurea* and *Campylopus atrovirens* were present and *Calluna vulgaris*, *Eriophorum vaginatum* and *Rhynchospora alba* were the dominant vascular plants. **Sc4** was of slightly better quality than **Sc3** or **Sc18**. The cover of *Cladonia portentosa* was low (ca. 5%). **Sc5** was dominated by complex 6/4 + P where there was evidence of flushing indicated by the scattered presence of *Molinia caerulea* and *Aulacomnium palustre*.

Lobe seven supported two areas of sub-central ecotope (18.52ha) as well as four active flushes (2.42ha; including **W2**, the best quality flush described earlier). **Sc1** and **Sc17** were dominated by complex 6/4 + P and complex 4/10. Complex 4/10 had a pool cover of 4-10%. However, the pools were not well defined and sometimes were more like *Sphagnum*-filled lawns and *Rhynchospora* dominated depressions. The overall *Sphagnum* cover was 34-75% composed mostly of *S. papillosum*, but also with high covers of *S. capillifolium*, *S. magellanicum* and S. *cuspidatum*. Active hummocks of

S. austinii were also present and *Calluna vulgaris* and *Rhynchospora alba* were the most dominant vascular plants. The cover of *Cladonia portentosa* was low (ca. 5%). Flush **G**, **X2** and **Y2** were similar flushes, being irregularly shaped with a narrow linear axis indicating flow paths. Pools were absent and the *Sphagnum* cover was 34-75% composed mostly of hummocks *S. capillifolium* with *S. papillosum* and *S. cuspidatum* also present. Tall *Calluna vulgaris* dominated the vegetation along with a much lower cover of *Eriophorum vaginatum* with *Molinia caerulea*, *Vaccinium oxycoccos*, *Polytrichum strictum* and *Aulacomnium palustre* also present. The cover of *Cladonia portentosa* was very low (< 5%). A small (c. 10x5m) scrub area, dominated by *Salix* sp., with *Myrica gale*, tall *Calluna vulgaris*, and *Empetrum nigrum* also present in **Y2**.

Lobe eight and nine supported no ARB, while lobe ten supported a small area (0.24ha) of sub-central ecotope (**Sc21**) and a small (0.05ha) active flush (flush **A**). Sc21 was dominated by complex 4/10, which is summarised above while flush **A** is a small flushed area with its central axis dominated by *Juncus effusus*. The north-eastern end of the flush has a high cover of *Sphagnum cuspidatum* while the *Sphagnum* layer in the south-west is dominated by *S. capillifolium* and *S. papillosum* and also supports *S. fallax* and *S. palustre*.

Degraded Raised Bog (7120)

The current area of Degraded Raised Bog at Bellanagare Bog is 829.28ha (94.36% of the high bog).

Degraded Raised Bog includes the sub-marginal, marginal and face bank ecotope, as well as inactive flushes and Dry Woodland. 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 (323.82ha) features the most developed micro-topography within Degraded Raised Bog. Ten community complexes (with additional variants) were recorded within the sub-marginal ecotope: 9/7, 9/7/4, 9/7/6, 9/7/3 + P, 9/7/2 + P, 6/3/9 + P, 9/6/3 + P, 9A/6/3, 7/9 and 6/3/9. Complex 9/7 was the best quality sub-marginal complex. *Calluna vulgaris* and *Eriophorum vaginatum* dominated the vegetation in complex 9/7 and the *Sphagnum* cover, which ranged from 34 to 50%, was composed almost entirely of hummocks of *S. capillifolium*. Complex 6/3/9, 7/9, 9A/6/3, 9/6/3 + P and 6/3/9 + P were the poorer quality sub-marginal complexes where the *Sphagnum* cover ranged from 11-25% and *Carex panicea* and *Narthecium ossifragum* were more common.

Marginal ecotope (367.30ha) is slightly drier than sub-marginal ecotope and was mainly recorded as a band around the margin of the high bog. Four marginal complexes were recorded on complex 3/67, 3/6/2, 3/6 and 7/2. The *Sphagnum* cover is even lower here than in the sub-marginal ecotope

(usually <10%) and the vegetation is characterised by a higher cover of *Carex panicea, Narthecium ossifragum, Trichophorum germanicum* and *Calluna vulgaris*.

Face bank ecotope (10.79ha) is characterised by firm ground, tall *Calluna vulgaris*, poor *Sphagnum* cover and a flat micro-topography.

The high bog also features several inactive flushes (flush **B**, **C**, **D**, **E**, **F**, **R1-3**, **T2**, **U2**, **V2**, **W3-5**, **X**, **X3-5**, **Y**, **Y3**, **Y4**, Z and **Z2-5**). Many of these had a low *Sphagnum* cover (<25%) and were dominated by *Molinia caerulea*. However, **R2** and **R3** on lobe three had a relatively high *Sphagnum* cover (34-50%) and were borderline active flush. However, the *Sphagna* layer was almost exclusively dominated by hummocks of *S. capillifolium*. *Calluna vulgaris* and *Eriophorum vaginatum* dominated the vegetation *Molinia caerulea*, *Vaccinium oxycoccos* and *Aulacomnium palustre* were present at low cover values. **W5** was a small area of dry Betula pubescens dominated woodland on the south of lobe three that had zero *Sphagnum* and abundant *Rhytidiadelphus triquetrus*, *Thuidium tamariscinum* and *Rubus fruticosus*. A small stream/channel flowed through the wood.

Depressions on peat substrates of the Rhynchosporion (7150)

Rhynchosporion vegetation is widespread on Bellanagare. It is found in both Active and Degraded Raised Bog, but tends to be best developed and most stable in the wettest areas of Active Raised Bog. In these areas, the Rhynchosporion vegetation occurs within *Sphagnum* hollows and along *Sphagnum* pool edges and on lawns. It was most frequent in the sub-central complexes 4/10, 6/4 + P and 9/7/4 + P. Typical plant species include *Rhynchospora alba*, *Sphagnum cuspidatum, S. magellanicum, S. papillosum*, *Drosera anglica* and *Eriophorum angustifolium*.

R. alba was also found within degraded raised bog, but always associated with wet features such as hollows and run off channels being particularly frequent erosion channels within the marginal complex 3/6/4.

Detailed vegetation description of the high bog

A detailed description of high bog vegetation recorded during the 2013 survey of Bellanagare 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 Bellanagare 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	5.77ha of the high bog cut away	Inside High Bog: 102 different locations along north (64 plots), northeast (8 plots), east (11 plots), southeast (5 plots), south (4 plots), southwest (1 plot), west (4 plots) and northwest (5 plots) of high bog.	**7110/7120/7150**
J02.07	Drainage	H	-1	59.541km [1]	Inside High Bog	**7110/7120/7150**
J02.07	Drainage	M	-1	n/av	Outside High Bog	**7110/7120/7150**
I01	Invasive alien species	L	-1	<0.1ha [3]	Inside High Bog	**7110/7120/7150**
B01.02	Artificial planting on open ground (non-native trees)	L	-1	9.5ha	Inside High Bog	**7110/7120/7150**
B01.02	Artificial planting on open ground (non-native trees)	L	-1	132ha	Outside High Bog	**7110/7120/7150**
4.2	Restoring/Improving the hydrological regime	M	+1	34.14km[2]	Inside High Bog	**7110**
4.2	Restoring/Improving the hydrological regime	H	+1	34.14km[2]	Inside High Bog	**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.

[2] This figure includes blocked drains on high bog.

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

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

Peat cutting

This activity has taken place at 102 locations (plots) along the northern (64 plots), northeast (8 plots), east (11 plots), southeast (5 plots), south (4 plots), southwest (1 plot), west (4 plots) and northwest (5 plots) section of high bog in the 2004-2010 period and has reduced the area of high bog by 5.77ha. The loss of high bog from peat cutting is calculated using GIS techniques on aerial photography from 2004/05 and 2010. Information from the NPWS indicates that 34 plots were cut on the high bog at Bellanagare in 2010/2011. This activity has continued in 2012/13 according to the most recent NPWS data. Thus, the area of high bog lost on Bellanagare during the reporting period is in excess of 5.77ha, but since there is no aerial photography available post 2010, the area lost from 2010 to 2013 cannot be estimated. Indeed, 2013 NPWS data indicates that turf cutting continues at the site.

There are a particularly high number of plots along the north of lobe 10 and this is likely to have contributed to the loss of ARB in **Sc13**. Cutting may also have contributed to the loss of ARB on lobes 1 (**Y4**), 6 (from **Sc3**, **Sc5** and **Sc18**) and 7 (from **Sc1**).

This activity is considered to have a high importance/impact on raised bog habitats. In addition, old face banks and high bog and cutover drainage associated with cutting continue to cause negative impacts on the high bog habitats.

Drainage

High bog drainage

Table 6.2 shows that 2.985km of drains classed as functional in 2004 are now classed as reduced functional in 2013 due to infilling. This has occurred in the middle section of drain bC24 (where it separates lobe 5 from lobe 6), the western section of drain b2E, drain b3B and drain b4H. However, there are still 11.242km of unblocked functional drains on the high bog and a further 13.015km of unblocked reduced functional drains. Furthermore, the majority of the blocked drains remain reduced functional (34.140km) with some blocked drains still classed as functional (1.018km). It is important to realise that reduced functional drains are still impacting on high bog habitats and will continue to do so until they are blocked and become completely in-filled and thus non-functional.

Significant water losses through some drains were noted during the 2013 surveys. These included the north-western end of drain bB1 (very fast flow recorded), which drains flush **Z** (in which there was a 0.10ha loss of ARB from 2004-2013), drain bC (fast flow recorded where it is not blocked in its northern-most extent at the very west of lobe 10), drain bD (western end), drain bN1 and bO (slow flow recorded in these drains which drain the area formerly classed as **Sc13** that has degraded to

sub-marginal ecotope), drains mK and bR (fast flow recorded) in lobe 9, drains b2C and bC24 (where is passes through lobe 7) which drain **Sc1** (in which there has been a 1.0ha loss of ARB from 2004-2013), drain b3D (very fast flow recorded) in lobe 5, drains b3H3, b3H4 and b3H5 in lobe 3, drain b4E in lobe 2 and drains b4H4 and b4H8 in lobe 1.

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

Table 6.2 High bog drainage summary

Status	2004 (km) [1]	2013 (km)	Change
NB: functional	13.719	10.734	(-)2.985
NB: reduced functional	10.030	13.015	(+)2.985
NB: non- functional	9.589	9.589	0.000
B: functional	1.526	1.526	0.000
B: reduced functional	34.140	34.140	0.000
B: non- functional	0.000	0.000	0.000

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

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

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

Table 6.3 High bog drainage detail

Drain Name	Length (km)	2004 status	2013 status	Change	Comment
bA	3.380	B: reduced functional	B: reduced functional	No	Drain complex
bA	0.036	NB: functional	NB: functional	No	Small drain to west of drain complex
bA1	0.219	NB: functional	NB: functional	No	
bB	4.618	B: reduced functional	B: reduced functional	No	Drain complex
bB1	0.222	NB: functional	NB: functional	No	Very fast water flowing recorded during 2013 visit
bC	19.708	B: reduced functional	B: reduced functional	No	Drain complex
bC	0.477	NB: functional	NB: functional	No	Drain to north-east of drain complex; fast water flowing recorded during 2013 visit
bD	2.589	B: reduced functional	B: reduced functional	No	Drain complex
bD	0.508	B: functional	B: functional	No	Western end of northern-most of the

					double drains; water flowing through pipes inserted close to top of peat dams recorded during 2013 visit
bE	0.057	NB: reduced functional	NB: reduced functional	No	
bF	0.417	NB: non-functional	NB: non- functional	No	
bG	0.203	NB: non-functional	NB: non- functional	No	
bH	0.198	NB: non-functional	NB: non- functional	No	
bJ	3.361	NB: non-functional	NB: non- functional	No	Drain complex
bJ4	0.397	NB: reduced functional	NB: reduced functional	No	This drain was wrongly classified as non-functional in 2004. This was mapped as bJ in 1995 and 2004.
bJ1	0.083	NB: non-functional	NB: non- functional	No	
bJ2	0.038	NB: functional	NB: functional	No	
bJ3	0.039	NB: functional	NB: functional	No	
bK	0.184	NB: non-functional	NB: non- functional	No	
bK2	0.138	NB: functional	NB: functional	No	
bM	0.186	NB: non-functional	NB: non- functional	No	
bM1	0.237	NB: non-functional	NB: non- functional	No	
bN	0.118	NB: reduced functional	NB: reduced functional	No	
bN1	0.063	NB: functional	NB: functional	No	Drain already present in 2004 but not mapped; slow water flowing recorded during 2013 visit
bO	0.375	B: reduced functional	B: reduced functional	No	Western section of double drain
bO	0.132	NB: functional	NB: functional	No	Eastern section of double drain; slow water flow recorded during 2013 visit
bP	0.847	B: reduced functional	B: reduced functional	No	Drain complex
bP	0.055	NB: functional	NB: functional	No	Drain to east of drain

					complex
bR	0.513	NB: functional	NB: functional	No	Fast flow heading north recorded during 2013 site visit
bT	0.119	NB: functional	NB: functional	No	Eastern section of drain
bT	0.499	NB: reduced functional	NB: reduced functional	No	Western section of drain
bX3	0.764	NB: functional	NB: functional	No	Drain within flush X3
bY3	0.802	NB: functional	NB: functional	No	Drain within flush Y3
mK	0.456	NB: functional	NB: functional	No	Water flowing recorded during 2013 visit
bH1	0.632	NB: non-functional	NB: non- functional	No	
b2C	0.319	NB: functional	NB: functional	No	Drain wrongly mapped as blocked in 2004 and incorrectly labelled (on map only) as bC; southern section; water flowing recorded during 2013 visit
b2C	0.234	NB: reduced functional	NB: reduced functional	No	Drain wrongly mapped as blocked in 2004 and incorrectly labelled (on map only) as bC; northern section
bC24	0.105	B: reduced functional	B: reduced functional	No	Northern section of drain
bC24	1.372	NB: functional	NB: functional	No	Southern and middle sections of drain; very fast water flowing recorded during 2013 visit; most northern of the middle sections (Lobe 7) wrongly mapped as blocked in 2004.
bC24	1.092	NB: functional	NB: reduced functional	Yes	Middle section of drain
bC24	0.294	NB: reduced functional	NB: reduced functional	No	Middle section of drain
b2B	0.409	B: reduced functional	B: reduced functional	No	Drain complex
b2D	0.313	NB: non-functional	NB: non- functional	No	
b2E	0.180	NB: non-functional	NB: non- functional	No	Eastern section of drain; drain wrongly mapped as functional in 2004
b2E	0.757	NB: functional	NB: reduced	Yes	Western section of

			functional		drain
b2E1	0.134	NB: functional	NB: functional	No	This drain was wrongly classified as reduced functional in 2004
b2E2	0.550	NB: functional	NB: functional	No	Southern section of double drain
b2E2	1.072	NB: reduced functional	NB: reduced functional	No	Northern section of double drain
b2F	0.178	NB: functional	NB: functional	No	
b2G	0.510	B: functional	B: functional	No	Northern drain of this drain complex is functional
b2G	2.109	B: reduced functional	B: reduced functional	No	Some of these drains might be functional as not all were surveyed in 2013.
b2H	1.063	NB: reduced functional	NB: reduced functional	No	These double drain was wrongly classified as non-functional in 2004
b2H1	0.137	NB: functional	NB: functional	No	Drain already present in 2004 but not mapped
b2H2	0.079	NB: non-functional	NB: non- functional	No	Drain already present in 2004 but not mapped
b2H3	0.054	NB: functional	NB: functional	No	Drain already present in 2004 but not mapped
b3A	1.020	NB: functional	NB: functional	No	Drain complex
b3B	0.385	NB: functional	NB: reduced functional	Yes	
b3D	0.245	NB: functional	NB: functional	No	Southern section of drain; very fast water flowing recorded during 2013 visit
b3D	0.149	NB: non-functional	NB: non- functional	No	Northern section of drain
b3D1	0.161	NB: non-functional	NB: non- functional	No	Drain already present in 2004 but not mapped
b3E	2.152	NB: reduced functional	NB: reduced functional	No	Double drain; drain wrongly mapped as functional in 2004.
b3EH	0.201	NB: non-functional	NB: non- functional	No	Drain already present in 2004 but not mapped
b3EJ	0.204	NB: reduced functional	NB: reduced functional	No	Drain already present in 2004 but not mapped
b3EK	0.079	NB: non-functional	NB: non- functional	No	Drain already present in 2004 but not mapped
b3EL	0.332	NB: reduced functional	NB: reduced functional	No	Drain already present in 2004 but not mapped
b3F	0.150	NB: reduced	NB: reduced	No	

		functional	functional		
b3G	0.729	NB: reduced functional	NB: reduced functional	No	Double drain
b3H	0.850	NB: non-functional	NB: non- functional	No	
b3H1	0.555	NB: non-functional	NB: non- functional	No	Drain already present in 2004 but not mapped
b3H2	0.321	NB: non-functional	NB: non- functional	No	Drain already present in 2004 but not mapped; western section of drain
b3H2	0.206	NB: functional	NB: functional	No	Drain already present in 2004 but not mapped; eastern section of drain
b3H3	0.241	NB: functional	NB: functional	No	Drain already present in 2004 but not mapped; water flowing recorded during 2013 visit
b3H4	0.193	NB: functional	NB: functional	No	Drain already present in 2004 but not mapped; water flowing recorded during 2013 visit
b3H5	0.058	NB: functional	NB: functional	No	Drain already present in 2004 but not mapped; water flowing recorded during 2013 visit
b3H6	0.161	NB: functional	NB: functional	No	Drains already present in 2004 but not mapped; drain complex
b3H7	0.092	NB: non-functional	NB: non- functional	No	This drain was wrongly classified as reduced functional in 2004
b3J	0.584	NB: non-functional	NB: non- functional	No	
b3K	0.244	NB: reduced functional	NB: reduced functional	No	
b3L	0.276	NB: reduced functional	NB: reduced functional	No	
b3M	0.188	NB: functional	NB: functional	No	
b3N	0.959	NB: reduced functional	NB: reduced functional	No	Drain complex
b4A	0.604	NB: reduced functional	NB: reduced functional	No	Double drain
b4A1	0.149	NB: functional	NB: functional	No	Drain already present in 2004 but not mapped

b4B	0.267	NB: functional	NB: functional	No	
b4C	0.157	NB: functional	NB: functional	No	
b4D	0.348	NB: functional	NB: functional	No	
b4E	0.638	NB: functional	NB: functional	No	Western and middle section of drain; water flowing recorded during 2013 visit
b4E	0.172	NB: non-functional	NB: non- functional	No	Eastern section of drain
b4E	0.235	NB: reduced functional	NB: reduced functional	No	Middle section of drain
b4G	0.300	NB: functional	NB: functional	No	
b4H	0.751	NB: functional	NB: reduced functional	Yes	Double drain
b4H1;2;3	0.282	NB: reduced functional	NB: reduced functional	No	Drains already present in 2004 but not mapped
b4H4	0.052	NB: functional	NB: functional	No	Drain already present in 2004 but not mapped; water flowing WNW recorded during 2013 visit
b4H5	0.080	NB: reduced functional	NB: reduced functional	No	Drain already present in 2004 but not mapped
b4H6	0.067	NB: functional	NB: functional	No	
b4H7	0.352	NB: non-functional	NB: non- functional	No	This drain was wrongly classified as reduced functional in 2004
b4H8	0.135	NB: functional	NB: functional	No	Drain already present in 2004 but not mapped; water flowing recorded during 2013 visit
b4J	0.049	NB: reduced functional	NB: reduced functional	No	Drain already present in 2004 but not mapped

Bog margin drainage

The cutover areas were not surveyed for drains during 2013.

Fernandez *et al.* (2005) noted that there is an extensive peripheral drainage system on Bellanagare associated with peat cutting, forestry plantations on the cutover and several roads, which extend into the high bog. Indeed drains associated with either currently active or no longer active peat cutting are present along the entire cutover. These drains continue to drain the high bog and impacting on high bog habitats. Fernandez *et al*. (2005) also noted that there is very little drainage to the east of high bog where peat cutting is less extensive as the land is owned by the NPWS. For a more detailed description of the hydrology of the high bog and cutover, see Kelly *et al.* (1995).

Evidence of adjacent land agriculture drainage maintenance is visible on the 2010 aerial photograph to the north-east (E173021/N287265; 300m drain); east (E172034/N285436; 200mdrain); south-east (E171022/N284415; 1.000m drain); west (E169694/N286082; 300m drain). In addition there was drainage maintenance on cutover areas where peat cutting took place in the reporting period.

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

Fire history

Fernandez *et al*. (2005) mentioned the frequent occurrence of burning at the site and noted that a fire event occurred on lobes 5, 6, 7, 8, 9 and 10 in the mid and north of the site in 2003/04, damaging 24% of the high bog area and disturbing large tracts of active raised bog. It was also noted that previous surveys (Schouten, 1979-81 in Douglas and Grogan, 1985) had recorded that much of the bog had been burnt in the late 1970s and in 1984. However, Kelly *et al.* (1995) noted that prior to their survey recent fire events had occurred in only two small areas.

No evidence of a fire having occurred on the high bog from 2005 to 2013 was recorded during the current survey.

Invasive species

A single *Rhododendron ponticum* bush (2.5m in height) is present in the north-east of the high bog within Lobe 10. This was also noted by Fernandez *et al.* (2005) and Kelly *et al.* (1995). No evidence of it spreading has been recorded. A 1.0m *Rhododendron ponticum* bush was also recorded during the 2013 survey towards the east of Lobe 1. This was not recorded previously.

A small number of *Pinus contorta* were recorded during the 2013 survey adjacent to conifer plantations in the west of Lobe 3 and the south-west of Lobe 2. On Lobe 3 the *Pinus contorta* trees were described as occurring in a very small area (within drainage complex b3H6) and being up to 5-6m tall (but mostly 2-3m) while on Lobe 2, they were recorded as being up to 2m tall and not spreading very far into the high bog.

Campylopus introflexus is recorded as being frequent on Bellanagare Bog, particularly in the north of the site on peat dams and around drains where there is much disturbed ground from peat excavations.

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

Afforestation and forestry management

There are four blocks of conifer plantations (not all are within the SAC) measuring a total of 9.5ha in extent on the high bog at Bellanagare; two on Lobe 2 and one on each of Lobes 3 and 4. Considering the size of the high bog, these plantations are relatively small and are likely to be having a negative impact of a low intensity on high bog habitats. Nevertheless their removal (as well as the blocking of any associated drains) is recommended as it will undoubtedly lead to an improvement in the condition of the high bog.

There are also conifer plantations on adjacent cutover bog (not all are within the SAC) to the north-west (adjacent to Lobe 9 measuring 24ha), to the north-east (adjacent to Lobes 9 and 10 measuring 35ha), to the east (adjacent to Lobe 7 measuring 8ha), to the south-west (adjacent to Lobes 2 and 3 measuring 45ha) and to the west (adjacent to Lobe 7 measuring 20ha).

The conifer plantation on the high and cutover are both considered having a low importance/impact on raised bog habitats.

Other impacting activities

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

Conservation activities

According to Fernandez *et al.* (2005), the NPWS owned 670ha (high bog and cutover) at the site in 1997 with the remainder held in multiple private ownership. Of the land owned by the NPWS, 83% was held as freehold and 17% was owned as fee simple meaning that in this 17%, the NPWS does not hold the turbary rights.

A Raised Bog Restoration Project (assisted by the EU Cohesion Fund) commenced in 1994 and ran up to the end of 1999. This involved the purchasing of 149ha of bog at Bellanagare and the blocking of high bog drains in the purchased land in 1996/97. Most of the high bog drains in the north Bellanagare (drains bA, bB, b2B, bC, b2C, bC24; only at its northern section, bD, b2G, bO and bP) were blocked at this time (Fernandez *et al.*, 2005) by using peat from adjacent to the drain to act as a dam, ensuring that the dams projected above the general bog surface so that the water in the drain must be retained.

Positive results from the blocking of drains bC24 and drainage complex bC (this was erroneously referred to as drain b2C in the 2005 report) were recorded by Fernandez *et al.* (2005) with some sub-central habitat (complex 9/7/10 RB in **Sc13**) recorded. The area in general was considered to be re-

wetting with a very wet surface and a high *Sphagnum* cover (up to 70% despite parts having been burnt in 2003/04). However, water was recorded flowing in the blocked part of drain bC24; the partial failure of dams in this area was attributed to the relatively steep slopes.

Fernandez *et al*. (2005) reported that drain complexes bA, bB, bC and bD in Lobes 8 and 10 were blocked to varying degrees of success noting that infilling processes were occurring within these drains with standing water noted in many of them. Furthermore, they noted that large *Sphagnum* dominated pools had developed beside the drains in places where peat had been excavated from the bog surface for dam building. Indeed a number of small areas of active flush and an area of sub-central ecotope were mapped within this restored area by Fernandez *et al*. (2005). However, these areas of active raised bog were not remapped in 2013, partially due to interpretation differences (the artificial *Sphagnum*-filled pools were alone not considered to represent high enough quality for an area to be considered as ARB). It was also noted in 2004 that because of the large dimensions of some of the blocked drains and the relatively steep slope of the high bog, water continued to flow in the drains even after their blocking and that new (at the time in 2004) narrow drains had been excavated at the north-eastern edge of drainage complex bC as an attempt to interrupt restoration process. It is in this area that there has been a loss of some ARB (**Sc13**) from 2004-2013 and thus these 'new' drains may be responsible. It is thus imperative that the remaining unblocked drains be blocked in this area and that the blocked drains themselves be assessed comprehensively as some of the dams were noted in the 2013 survey as having been breached and in need of repair. Unblocked drains in this area where a particularly fast flow of water was noted during the 2013 survey include the north-western end of drain bB1, drains mK and bR and the northern-most extent of drain bC (at the very west of lobe 10). These drains should obviously be prioritised for damming in the future. It is also worth noting that the western end of drain bD is classed as functional despite being blocked. This is because on construction of the dams, plastic pipes were inserted close to the top of the dams to allow water flow through the drain in order to allay fears that the dams would be eroded away due to the volume of water entering the drains.

Fernandez *et al*. (2005) reported that water continued to flow in the blocked drain complexes bP and bO particularly towards the high bog edge. Water flow was again observed in these drains in 2013 and thus again the dams in these drains need to be repaired.

Drains b2B and b2G were also blocked and described by Fernandez *et al.* (2005) as reduced functional. In 2013, water was again noted flowing in the blocked part of drain bC24, and a number of wet patches with pools and high *Sphagnum* cover was recorded in and around the drains/dams. A high cover of *Molinia caerulea* was also noted in and around drain bC24. A small expansion of

sub-central (**Sc1**) ecotope (0.15ha) was recorded close to where bC24 and b2B meet and this is attributed to the re-wetting of this area brought about by the blocking of drains.

The NPWS has also engaged in negotiation with landowners in relation to the cessation of peat cutting at the site. This has contributed to the reduction in peat cutting. However, despite negotiations, peat cutting has continued.

Although the high bog drainage blocking occurred on Bellanagare prior (11996-97) to the reporting period (2005-2013), it is reported as positive management actions under Restoring/Improving the hydrological regime (4.2) within table 1. The drain blocking is considered to have had a high importance/impact on Degraded Raised Bog and Rhynchosporion depressions and a medium importance/impact on Active Raised Bog. The logic being that there are only very small amounts of ARB after forming as a result of drain blocking, but that without the drain blocking the relatively large area of sub-marginal ecotope that covers the area where lobes 8 and 10 meet (east of flush Y) would likely have degraded to marginal ecotope.

Conservation status assessment

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

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

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

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

Active Raised Bog (7110)

Area

Table 8.1 indicates that there has been a decrease (3.21ha) in the extent of Active Raised Bog habitat on Bellanagare from 2004 to 2013. Most of this loss has been from sub-central ecotope (3.11ha) with 0.10ha of active flush lost. The gross decrease recorded in extent was actually higher (4.36ha), but this was balanced somewhat by small (1.15ha) expansions of ARB in **Sc1** and **Sc2** brought about by the blocking and/or infilling of drains. There have also been some changes to the distribution of the habitat as a result of the 2013 survey being more comprehensive than previous ones. Each individual area of ARB on Bellanagare is discussed below:

C1: Located in lobe five of the high bog. This is a newly recorded area of central ecotope (in part of an area formerly mapped as **Sc7**) and it is likely that it was recorded as a result of the 2013 survey being more comprehensive with an increased mapping accuracy than that of the 2004 survey. However, it should not be ruled out that the central ecotope here has developed as a result of rewetting brought about by the infilling of drains, particularly drain b3E to the south, which although classed as reduced functional was noted as being almost completely infilled and thus non-functional in places. Indeed, one sub-central point from 2004 lies within the area now classed as **C1**. However, on the whole there is insufficient evidence to be certain that there has been an improvement in the quality of ARB here and thus **C1** is considered to be stable, possibly increasing.

C2: Located in lobe five of the high bog. This is a newly recorded area of central ecotope (in part of an area formerly mapped as **Sc2**) and it is likely that it was recorded as a result of the 2013 survey being more comprehensive with an increased mapping accuracy than that of the 2004 survey. However, it should not be ruled out that the central ecotope here has developed as a result of rewetting brought about by the infilling of drains, particularly drain b3E to the south, which although classed as reduced functional was noted as being almost completely infilled and thus non-functional in places. Indeed, one sub-central point from 2004 lies within the area now classed as **C2**. However, on the whole there is insufficient evidence to be certain that there has been an improvement in the quality of ARB here and thus **C2** is considered to be stable, possibly increasing.

Sc1: Located in lobe seven of the high bog. There are changes all around the boundary as a result of the increased mapping accuracy of the 2013 survey resulting in **Sc1** being mapped as smaller and more fragmented than in 2004 (the former area of **Sc1** is now divided into two separate areas of sub-central; **Sc1** and **Sc17** with sub-marginal ecotope mapped in between them). Evidence of degradation having taken place here is illustrated by the fact that five sub-central points taken in 2004 now lie outside of the extent of either **Sc1** or **Sc17**. The loss of ARB from **Sc1** is estimated to be 1.0ha with most of this loss occurring in the south of the new extent of **Sc1**. On the other hand, **Sc1**

has expanded (by an estimated 0.15ha) in its north-western extent where drain bC24 and b2B meet. Drain b2B and part of drain bC24 was blocked in 1996/97 as part of a restoration programme and thus re-wetting is taking place in these areas resulting in the expansion of ARB. However, on the whole there has been a net decrease of an estimated 0.85ha of ARB within the former extent of **Sc1** and thus **Sc1** is considered to be decreasing. The loss of ARB here is most likely due to high bog drainage, particularly from drains b2C, bC24, b2E and b2F, but may also be at least partially attributed to the ongoing peat cutting occurring 88m to the north-east of **Sc1**.

Sc2: Located in lobe five of the high bog. There are changes all around the boundary as a result of the increased mapping accuracy of the 2013 survey resulting in **Sc2** being mapped as larger and less fragmented than in 2004 (**Sc2** now includes the former area of **Sc7**, which had been separated from the former area of **Sc2** by a band of sub-marginal ecotope). Evidence of rewetting having taken place here is illustrated by the fact that nine sub-marginal points and five marginal points taken in 2004 now lie inside the boundary of **Sc2**. The expansion of ARB in **Sc2** is estimated to be 1.0ha with most of this occurring in the north-west of the new extent of **Sc2**. The rewetting taking place is likely to have been brought about by the infilling of drains, particularly drain b3E to the south, which although still classed as reduced functional was noted as being almost completely infilled and thus non-functional in places. **Sc2** is considered to be increasing.

Sc3: Located in lobe six of the high bog. There are changes all around the boundary as a result of the increased mapping accuracy of the 2013 survey resulting in **Sc3** being mapped as smaller and more fragmented than in 2004 (the former area of **Sc3** is now divided into two separate areas of sub-central; **Sc3** and **Sc18** with sub-marginal ecotope mapped in between them). Evidence of degradation having taken place here is illustrated by the fact that five sub-central points taken in 2004 now lie outside of the extent of either **Sc3** or **Sc18**. The loss of ARB from **Sc3** is estimated to be 0.5ha with most of this loss occurring in the west of the new extent of **Sc3**. Thus **Sc3** is considered to be decreasing with the loss of ARB here most likely due to high bog drainage, particularly from drains bC24, b2E2 and b2H, but may also be at least partially attributed to the ongoing peat cutting occurring 283m to the south-east of **Sc18**.

Sc4: Located in lobe six of the high bog. There are slight changes all around the boundary as a result of the increased mapping accuracy of the 2013 survey resulting in **Sc4** being mapped as slightly smaller than in 2004. Although the difference is being attributed to improved mapping accuracy, it should not be ruled out that there has been a real loss of ARB in this area as three of the sub-central points recorded in 2004 now lie outside (two to the north and one to the south-east) of the area mapped as **Sc4** in 2013. However, the vegetation in this area was poor quality sub-central ecotope

(Complexes 6/3/2 + P and 2/6/3 + P) in 2004 and one isolated point of sub-central ecotope was recorded to the north of **Sc4** in 2013 and described as too small to map. Hence, there is insufficient evidence to be certain that there has been a decrease in the extent of ARB here and thus **Sc4** is considered to be stable, possibly decreasing.

Sc5: Located in lobe six of the high bog. There are changes all around the boundary as a result of the increased mapping accuracy of the 2013 survey resulting in **Sc5** being mapped as smaller than in 2004. Evidence of degradation having taken place here is illustrated by the fact that three sub-central points taken in 2004 now lie outside of the 2013 extent of **Sc5**. The loss of ARB from **Sc5** is estimated to be 0.35ha with most of this loss occurring in the north and west of the former extent of **Sc5**. Thus **Sc5** is considered to be decreasing with the loss of ARB here most likely due to high bog drainage, particularly from drain bC24, but may also be at least partially attributed to the ongoing peat cutting occurring 210m to the north of **Sc5** (185m to the north of former **Sc5**).

Sc6: Located in lobe seven of the high bog. This is no longer mapped as sub-central ecotope due to vegetation interpretation differences between the two surveys; it is now mapped as active flush (**X2**). See discussion of **X2** below for more details. Two points in the north of the former **Sc6** are now in an area mapped as sub-marginal ecotope. However, these points were a borderline sub-marginal/sub-central complex at the time (complex 9/7 + My), which would be mapped as sub-marginal ecotope using 2013 criteria.

Sc7: Located in lobe five of the high bog. This is no longer present as it has been amalgamated with the formerly adjacent **Sc2**. See discussion of **Sc2** above for more details.

Sc8: Located in lobe five of the high bog. This area of ARB is no longer present. However, the 'loss' of ARB here is considered to be due to interpretation differences between the 2004 survey and the 2013 survey (as well as the increased mapping accuracy of the 2013 survey) rather than to any real differences on the ground. Yet, it should not be ruled out that there has been a real loss of ARB in this area since there were three sub-central points recorded here in 2004. On the other hand, these points were recorded as poor quality sub-central (complex 3/2/9a + P) and since they were not described, there is insufficient evidence to be certain that there has been a decrease in the extent of ARB here and thus **Sc8** is considered to be stable, possibly decreasing.

Sc9: Located in lobe three of the high bog. This area of ARB is no longer present. However, the 'loss' of ARB here is considered to be due to interpretation differences between the 2004 survey and the 2013 survey (as well as the increased mapping accuracy of the 2013 survey) rather than to any real differences on the ground. Yet, it should not be ruled out that there has been a real loss of ARB in this area since there were four sub-central points recorded here in 2004. On the other hand, these

points were recorded as poor quality sub-central (complex 9/7 + P) with a maximum *Sphagnum* cover of 30-40%. One sub-central point was taken here in 2013 and described as too small to map. Thus, there is insufficient evidence to be certain that there has been a decrease in the extent of ARB here and hence **Sc9** is considered to be stable, possibly decreasing.

Sc10: Located in lobe one of the high bog. This is no longer mapped as sub-central ecotope due to vegetation interpretation differences between the two surveys; it is now mapped as active flush and inactive flush (**Y4**). See discussion of **Y4** below for more details.

Sc11: Located in lobe four of the high bog. There are changes all around the boundary as a result of the increased mapping accuracy of the 2013 survey resulting in **Sc11** being mapped as smaller than in 2004. Evidence of degradation having taken place here is illustrated by the fact that four sub-central points taken in 2004 now lie outside of the 2013 extent of **Sc11**. The loss of ARB from **Sc11** is estimated to be 0.5ha with most of this loss occurring in the northwest and southeast of the former extent of **Sc11**. Thus **Sc11** is considered to be decreasing with the loss of ARB here most likely due to high bog drainage, particularly from drain complex bJ and drain bY3.

Sc12: Located in lobe three of the high bog. This area of ARB is no longer present. However, the 'loss' of ARB here is considered to be due to interpretation differences between the 2004 survey and the 2013 survey (as well as the increased mapping accuracy of the 2013 survey) rather than to any real differences on the ground. Only one sub-central point was recorded here in 2004 and that was classed as a borderline sub-central/sub-marginal complex (9/7/10 + Ph). A sub-marginal point (complex 9/7 + Ph) recorded in 2013 was described as being borderline sub-marginal/sub-central and hence it is likely that vegetation interpretation differences are responsible for the 'loss' of ARB here and thus **Sc12** is considered to be stable.

Sc13: Located in lobe ten of the high bog. This area of ARB is no longer present. Evidence of degradation having taken place here is illustrated by the fact that there were three sub-central points (complex 9/7/10 RB) taken in 2004. The loss of ARB from **Sc13** is estimated to be 0.66ha. Thus **Sc13** is considered to be decreasing with the loss of ARB here most likely due to high bog drainage, particularly from drains bO and bN1 (water flow was recorded in both these drains during the 2013 survey) and drainage complex bC, but is also at least partially attributed to the ongoing peat cutting occurring 120m to the east-northeast of former **Sc13**.

Sc14: Located in lobe three of the high bog. This is a newly recorded area of sub-central ecotope and was recorded as a result of the 2013 survey being more comprehensive with an increased mapping accuracy than that of the 2004 survey.

Sc15: Located in lobe two of the high bog. This is a newly recorded area of sub-central ecotope and was recorded as a result of the 2013 survey being more comprehensive with an increased mapping accuracy than that of the 2004 survey.

Sc16: Located in lobe two of the high bog. This is a newly recorded area of sub-central ecotope and was recorded as a result of the 2013 survey being more comprehensive with an increased mapping accuracy than that of the 2004 survey.

Sc17: Located in lobe seven of the high bog. This was formerly mapped as part of **Sc1**. See discussion of **Sc1** above for more details.

Sc18: Located in lobe six of the high bog. This was formerly mapped as part of **Sc3**. See discussion of **Sc3** above for more details.

Sc19: Located in lobe three of the high bog. This is a newly recorded area of sub-central ecotope and was recorded as a result of the 2013 survey being more comprehensive with an increased mapping accuracy than that of the 2004 survey.

Sc20: Located in lobe three of the high bog. This is a newly recorded area of sub-central ecotope and was recorded as a result of the 2013 survey being more comprehensive with an increased mapping accuracy than that of the 2004 survey.

Sc21: Located in lobe ten of the high bog. This is a newly recorded area of sub-central ecotope and was recorded as a result of the 2013 survey being more comprehensive with an increased mapping accuracy than that of the 2004 survey.

Flush **A**: Located in lobe ten of the high bog. This is a newly recorded area of active flush and was recorded as a result of the 2013 survey being more comprehensive with an increased mapping accuracy than that of the 2004 survey.

Flush **G**: Located in lobe seven of the high bog. This is a newly recorded area of active flush and was recorded as a result of the 2013 survey being more comprehensive with an increased mapping accuracy than that of the 2004 survey.

Flush **X**: Four separate small areas of ARB were mapped in 2004 within flush **X**, located in lobe eight of the high bog. These areas of ARB are no longer present. However, the 'loss' of ARB here is considered to be due to interpretation differences between the 2004 survey and the 2013 survey (as well as the increased mapping accuracy of the 2013 survey) rather than to any real differences on the ground. Indeed one of the active flush polygons had no points taken within it in 2004, while another had only one (the others having 3 and 4 respectively). Furthermore, there are no descriptions of these areas and hence there is insufficient evidence to be certain that there has been

a decrease in the extent of ARB here and thus ARB within flush **X** is considered to be stable, possibly decreasing.

Flush **X2**: Located in lobe seven of the high bog. There are changes all around the boundary as a result of the increased mapping accuracy of the 2013 survey resulting in **X2** being mapped as larger than in 2004. The size and shape of **X2** mapped in 2013 is extremely different from that of 2004 due also to vegetation interpretation differences between the two surveys with part of what was mapped as **Sc6** in 2004 mapped as active flush in 2013. Nevertheless, the extent of **X2** is considered to have remained stable.

Flush **X3**: Located in lobe three of the high bog. This is a small *Sphagnum*-filled pool found close to drain bC24 within a much larger area of inactive flush, **X3**. The area of the pool was estimated at 10m x 7m in both surveys and thus the ARB within **X3** is considered to be stable.

Flush **W2**: Located in lobe seven of the high bog. There are slight changes all around the boundary as a result of the increased mapping accuracy of the 2013 survey resulting in **W2** being mapped as slightly larger than in 2004. Hence, the extent of **W2** is considered to be stable.

Flush **Y2**: Located in lobe seven of the high bog. There are changes all around the boundary as a result of the increased mapping accuracy of the 2013 survey resulting in **Y2** being mapped as larger than in 2004. The size and shape of **Y2** mapped in 2013 is extremely different from that of 2004 due also to vegetation interpretation differences between the two surveys with part of what was mapped as **Sc1** in 2004 mapped as active flush in 2013. Nevertheless, the extent of **Y2** is considered to have remained stable.

Flush **Y3**: Located in lobe five of the high bog. This area of ARB is no longer present. However, the 'loss' of ARB here is considered to be due to interpretation differences between the 2004 survey and the 2013 survey (as well as the increased mapping accuracy of the 2013 survey) rather than to any real differences on the ground. Only one active flush point was taken here in 2004 and this was recorded where the double drain b3E crosses through the flush. An active flush point was also taken here in 2013, but described as too small to map. Hence, the extent of ARB within **Y3** is considered to be stable.

Flush **Y4**: Located in lobe one of the high bog. There are changes all around the boundary as a result of the increased mapping accuracy of the 2013 survey resulting in **Y4** being mapped as much larger than in 2004. The size and shape of **Y4** mapped in 2013 is extremely different from that of 2004 due also to vegetation interpretation differences between the two surveys with part of what was mapped as **Sc10** in 2004 mapped as active flush in 2013 and part of it mapped as inactive flush (and also labelled **Y4**). However, the combined area of former **Sc10** and the former extent of active flush

in **Y4** are much smaller than the extent of active flush mapped within **Y4** in 2013. However, the loss of ARB here is difficult to estimate since a large part of it is due to vegetation interpretation differences between the two surveys illustrated by the fact that the southern 'half' of the former **Sc10** is now mapped as active flush (although described as being similar to the sub-central complex 9/7/10) while the northern 'half' is now mapped as inactive flush (although described as being similar to the sub-marginal complex 9/7). The difference between the two was considered subtle and it was noted that mapping a boundary between the two was difficult. Indeed in 2004, **Sc10** was classed as complex 9/7 + *Empetrum*, a borderline sub-marginal/sub-central complex and it was noted that the north of the area had some lower quality sub-marginal patches. Thus, although there is 5ha less of ARB mapped in this area in 2013 than in 2004, it is conservatively estimated that only 25% of this difference is real with the remainder attributed to interpretation and mapping differences. Nevertheless, the ARB within **Y4** is considered to be decreasing with the loss of ARB here most likely due to high bog drainage, particularly from drains bC24, b4H and b4H1-5, but may also be at least partially attributed to the ongoing peat cutting occurring 123m to the north and north-east.

Flush **Z**: Located in lobe eight of the high bog. This area of ARB is no longer present although two ARB points (too small to map) were taken in 2013. The degradation of this area is also illustrated by the loss of the open water pool, which lay to the north of the area formerly mapped as active flush. Hence, the area of ARB within flush **Z** is considered to be decreasing with the loss of ARB here most likely due to high bog drainage, particularly from drain bB1 in which a very fast flow of water was recorded during the 2013 survey.

To summarise it is estimated that there has been a net loss of 3.21ha of active raised bog (see table 8.1) with the largest loss (1.25ha) occurring within flush **Y4** (from former **Sc10**) on lobe 1 of the high bog. The next largest loss was from **Sc1** (net loss of 0.85ha) on lobe 7 where there also appears to be re-wetting in places (gross loss of 1.0ha of ARB with a 0.15ha increase in ARB) so that there appears to have been a change in the hydrological flow patterns within this lobe of high bog. A combined loss of 0.85ha was also estimated to have occurred from **Sc3** (0.5ha) and **Sc5** (0.35ha) in lobe six while a loss of 0.66ha was estimated from **Sc13** in lobe 10 and a loss of 0.5ha from **Sc11** was estimated in lobe four. A 0.1ha loss of active flush was estimated from flush Z in lobe eight while a 1.0ha increase in ARB was estimated in **Sc2** on lobe five. Most of the losses of ARB are attributable to high bog drainage (or a combination of high bog drainage and peat cutting as is the case with **Sc13** on lobe 10) while the increase in ARB is attributable to re-wetting from the infilling of high bog drains.

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 239.77ha (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 (49.59ha) is 79.32% below the FRV. A current Area value more than 15% below FRV falls into the **Unfavourable Bad** assessment category.

A long term (1994-2013) trend indicates a reduction in the area of Active Raised Bog at the site (of 42.27ha) (see table 8.1). A more recent and short term trend analysis (9 years; 2004-2013) also indicates a decrease in the area (of 3.21ha) of Active Raised Bog. Therefore, the habitat Area is given a **Decreasing** trend assessment.

The Area of Active Raised Bog at Bellanagare Bog is assessed as Unfavourable Bad-Decreasing (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 24.80ha (half of 49.59ha, the current area of Active Raised Bog). The current value is 11.32ha which is 54.35% below the FRV. As a value falling >25% below FRV falls into the Unfavourable-Bad assessment category, S&Fs of ARB on Bellanagare are given an **Unfavourable-Bad** assessment. Furthermore, it should also be taken into consideration that much of the active flush (apart from **W2**) on Bellanagare is not of the highest quality type. This is particularly true in the case of **Y4**, which is of very low quality type Active Raised Bog and is in fact similar to the lowest quality of sub-central type Active Raised Bog.

A long term (1994/5-2013) trend indicates an increase (of 4.02ha) in the combined area of central ecotope and active flush, whereas a short term trend (9 years; 2004-2013) shows no change and the S&Fs of ARB are therefore given a **Stable** trend. It should be noted also that the apparent long term increase is at least partially due to vegetation interpretation as flush **Y4** is only very subtly different from sub-central ecotope (complex 9/7/10) and this accounts for a large part of the apparent increase; the only real increase is likely to be in the development of central ecotope (0.36ha) on lobe 5, which may have occurred due to re-wetting brought about by the infilling of drain b3E.

Quadrats analysis (**Qsc1**, **Qsc2** and **Qsc3**) indicates the following (Quadrats **Qsm1** recorded in 2004 was not visited during the 2013 survey, while **Qsc4** and **Qaf1** were two new quadrats recorded in 2013 that were not recorded in 2004):

Qsc1: Complex 9/7 + P within the area of former **Sc9** on lobe 3: There was slight variation in the quadrat data compared to 2004: the cover of pools has increased slightly (from 4-10% in 2004 to 11-25% in 2013) while the overall *Sphagnum* cover has decreased (from 26-33% to 11-25%). However, there has been an increase in the cover of *S. cuspidatum* (<4% to 4-10%), but a decrease in the cover of *S. papillosum* (4-10% to <4%) and *S. capillifolium* (4-10% to <4%) with the cover of *S. magellanicum* remaining the same (4-10%). A slight decrease in the cover of *Trichophorum germanicum* (4-10% to <4%), *Narthecium ossifragum* (4-10% to <4%), *Rhynchospora alba* (4-10% to <4%) and *Cladonia portentosa* (4-10% to <4%) was also recorded as well as a large increase in the cover of *Calluna vulgaris* (4-10% to 34-50%). These changes may merely be the result of a discrepancy in the quadrat location (up to 2m) between both year surveys, rather than an actual change.

Qsc2: Complex 9/7 + P within **Sc11** on lobe 4: There was a very slight variation in the quadrat data compared to 2004: the cover of pools (11-25%) and the overall *Sphagnum* cover (26-33%) have remained the same. However, there has been an increase in the cover of *S. denticulatum* (absent to <4%), but a decrease in the cover of *S. austinii* (<4% to absent) and *S. capillifolium* (11-25% to 4-10%) with the cover of *S. cuspidatum* (4-10%) and *S. papillosum* (4-10%) remaining the same. A slight decrease in the cover of *Trichophorum germanicum* (4-10% to <4%), *Narthecium ossifragum* (<4% to absent) and *Rhynchospora alba* (4-10% to <4%) was also recorded as well as an increase in the cover of *Calluna vulgaris* (11-25% to 26-33%) and *Cladonia portentosa* (4-10% to 26-33%). These changes may merely be the result of a discrepancy in the quadrat location (up to 2m) between both year surveys, rather than an actual change.

Qsc3: Complex 6/4 + P within **Sc1** on lobe 7: There was slight variation in the quadrat data compared to 2004: the cover of pools has decreased slightly (from 26-33% in 2004 to 11-25% in 2013) while the overall *Sphagnum* cover (34-50%) have remained the same. However, there has been an increase in the cover of *S. papillosum* (4-10% to 26-33%), but a decrease in the cover of *S. austinii* (4-10% to absent) and *S. capillifolium* (11-25% to <4%) with the cover of *S. magellanicum* (<4%) remaining the same. The cover of *S. cuspidatum* was not recorded in 2004, but the cover of *Sphagnum* in pools/lawns was estimated to be 30% (allowing for a combined cover of *S. papillosum* and *S. magellanicum* of ca. 10%, the cover of *S. cuspidatum* was likely to have been 11-25%) while the cover of *S. cuspidatum* in 2013 was 4-10% indicating that there may have been a slight decrease in its cover. A decrease in the cover of *Trichophorum germanicum* (4-10% to <4%), *Narthecium ossifragum* (26-33%

to 4-10%) and *Rhynchospora alba* (11-25% to 4-10%) was also recorded as well as an increase in the cover of *Calluna vulgaris* (<4% to 26-33%) and *Cladonia portentosa* (absent to <4%). These changes may merely be the result of a discrepancy in the quadrat location (up to 2m) between both year surveys, rather than an actual change. However, some of the differences are likely to be due to the fact that the vegetation had been burned 1-2 years prior to 2004 and thus the vegetation is recovering from that fire (e.g. the large decrease in the cover of *Narthecium ossifragum* and the large increase in the cover of *Calluna vulgaris*).

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

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

Future Prospects

Habitat Area has decreased while the S&Fs are assessed as stable in the current reporting period. However, there are still over 11km of unblocked functional drains and over 13km of unblocked reduced functional drains on the high bog as well as over 1km of blocked but functional drains and over 34km blocked reduced functional drains. Furthermore, peat-cutting continues at the site, with 102 active turf cutting plots recorded in the reporting period and an approximate 34 identified in 2010/11. The high bog has been cutaway extensively and the current ARB area (49.59ha) represents a particularly small percentage (5.6%) of the total high bog area. No restoration measures at the site were carried out during the reporting period, which could override the negative influence of impacting activities.

Habitat **Area** is currently 79.32% below FRV (see table 8.4) and a Decreasing trend is foreseen due to the overriding influence of negatively impacting activities. The habitat Area is expected to be more than 15% below FRV in the following two reporting periods (12 years). Thus, habitat's **Area Future Prospects** are assessed as **Unfavourable Bad-Decreasing**. Habitat's **S&Fs** are currently 54.35% below FRV (see table 8.4) and a Declining trend is also foreseen. Therefore S&Fs are expected to be more than 25% below FRV in the following two reporting periods. **S&Fs Future Prospects** are assessed as **Unfavourable Bad-Declining**.

The overall habitat's Future Prospects are Unfavourable Bad-Declining (see table 8.5). Blocking of remaining reduced-functional and functional drains both on the high bog and cutover and cessation of peat cutting is necessary.

Cutover areas will play a major role in the restoration of the habitat as the current characteristics of the high bog may make it difficult to regenerate previous Active Raised Bog values on the high bog and there is potential for restoration of cutover around the entire perimeter of the site.

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

Table 8.1 Changes in Active Raised Bog area

Active Ecotopes	1994/5[1]	2004	2004 (amended)	2013	Change (2004-2013)	
	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	%
Central	0.00	0.00	0.36	0.36	0.00	0.00
Sub-central	84.56	56.93	41.38	38.27	(-)3.11	(-)7.52
Active flush	7.30	10.09	11.06	10.96	(-)0.10	(-)0.90
Total	**91.86**	**67.02**	**52.80**	**49.59**	**(-)3.21**	**(-)6.08**

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

Table 8.2 Assessment of changes in individual Active Raised Bog areas

Area	Quadrats	Trend	Comment	Quadrats analysis
C1	None	Newly recorded (possibly increasing)	This is a newly recorded area of central ecotope. It is likely that it was recorded as a result of the 2013 survey being more comprehensive with an increased mapping accuracy than that of the 2004 survey. However, it is possible that it is a newly developed area of central ecotope brought about by the infilling of drains (particularly drain b3E).	
C2	None	Newly recorded (possibly increasing)	This is a newly recorded area of central ecotope. It is likely that it was recorded as a result of the 2013 survey being more comprehensive with an increased mapping accuracy than that of the 2004 survey. However, it is possible that it is a newly developed area of central ecotope brought about by the infilling of drains (particularly drain b3E).	

Area	Quadrats	Trend	Comment	Quadrats analysis
Sc1	Qsc3	Decreasing	There are changes all around the boundary as a result of the increased mapping accuracy of the 2013 survey resulting in **Sc1** being mapped as smaller and more fragmented than in 2004 (the former area of **Sc1** is now divided into two separate areas of sub-central; **Sc1** and **Sc17**). Evidence of degradation having taken place here is illustrated by the fact that five sub-central points taken in 2004 now lie outside of the extent of either **Sc1** or **Sc17**. The loss of ARB from **Sc1** is estimated to be 1.0ha with most of this loss occurring in the south of the new extent of **Sc1**. On the other hand, **Sc1** has expanded (by an estimated 0.15ha) in its north-western extent where drain bC24 and b2B meet. Parts of these drains were blocked in 1996/97 as part of a restoration programme and thus re-wetting is taking place in these areas resulting in the expansion of ARB. However, on the whole there has been a net decrease of an estimated 0.85ha of ARB within the former extent of **Sc1** and thus **Sc1** is considered to be decreasing. The loss of ARB here is most likely due to high bog drainage, particularly from drains b2C, bC24, b2E and b2F, but may also be at least partially attributed to the ongoing peat cutting to the north-east of **Sc1**.	Slight variation in quadrat data: decrease in the pool cover (from 26-33% to 11-25%), in the cover of *S. austinii* (4-10% to absent) and *S. capillifolium* (11-25% to <4%); increase in the cover of *S. papillosum* (4-10% to 26-33%). These changes may merely be the result of a discrepancy in the quadrat location (up to 2m) between both year surveys, rather than an actual change. A large decrease in the cover of *Narthecium ossifragum* (26-33% to 4-10%) and an increase in the the cover of *Calluna vulgaris* (<4% to 26-33%) and *Cladonia portentosa* (absent to <4%) is attributable to the vegetation recovering from the fire of 2003/04.
Sc2	None	Increasing	There are changes all around the boundary as a result of the increased mapping accuracy of the 2013 survey resulting in **Sc2** being mapped as larger and less fragmented than in 2004 (**Sc2** now includes the former area of **Sc7**, which had been separated from the former area of **Sc2** by a band of sub-marginal ecotope). Evidence of rewetting having taken place here is illustrated by the fact that nine sub-marginal points and five marginal points taken in 2004 now lie inside the boundary of **Sc2**. The expansion of ARB in **Sc2** is estimated to be 1.0ha with most of this occurring in the north-west of the new extent of **Sc2**. The rewetting taking place is likely to have been brought about by the infilling of drains, particularly drain b3E to the south, which although still classed as reduced functional was noted as being almost	

Area	Quadrats	Trend	Comment	Quadrats analysis
			completely infilled and thus non-functional in places.	
Sc3	None	Decreasing	There are changes all around the boundary as a result of the increased mapping accuracy of the 2013 survey resulting in **Sc3** being mapped as smaller and more fragmented than in 2004 (the former area of **Sc3** is now divided into two separate areas of sub-central; **Sc3** and **Sc18**). Evidence of degradation having taken place here is illustrated by the fact that five sub-central points taken in 2004 now lie outside of the extent of either **Sc3** or **Sc18**. The loss of ARB from **Sc3** is estimated to be 0.5ha with most of this loss occurring in the west of the new extent of **Sc3**. Thus **Sc3** is considered to be decreasing with the loss of ARB here most likely due to high bog drainage, particularly from drains bC24, b2E2 and b2H, but may also be at least partially attributed to the ongoing peat cutting to the south-east of **Sc18**.	
Sc4	None	Stable (possibly decreasing)	There are slight changes all around the boundary as a result of the increased mapping accuracy of the 2013 survey resulting in **Sc4** being mapped as slightly smaller than in 2004. Although the difference is being attributed to improved mapping accuracy, it should not be ruled out that there has been a real loss of ARB in this area as three of the sub-central points recorded in 2004 now lie outside (two to the north and one to the south-east) of the area mapped as **Sc4** in 2013. However, the vegetation in this area was poor quality sub-central ecotope (Complexes 6/3/2 + P and 2/6/3 + P) in 2004 and one isolated point of sub-central ecotope was recorded to the north of **Sc4** in 2013 and described as too small to map. Hence, there is insufficient evidence to be certain that there has been a decrease in the extent of ARB here and thus **Sc4** is considered to be stable, possibly decreasing.	
Sc5	None	Decreasing	There are changes all around the boundary as a result of the increased mapping accuracy of the 2013 survey resulting in **Sc5** being mapped as smaller than in 2004. Evidence of degradation having taken place here is illustrated by the fact that three sub-	

Area	Quadrats	Trend	Comment	Quadrats analysis
			central points taken in 2004 now lie outside of the 2013 extent of **Sc5**. The loss of ARB from **Sc5** is estimated to be 0.35ha with most of this loss occurring in the north and west of the former extent of **Sc5**. Thus **Sc5** is considered to be decreasing with the loss of ARB here most likely due to high bog drainage, particularly from drain bC24, but may also be at least partially attributed to the ongoing peat cutting to the north.	
Sc6	None	No longer present	This is no longer mapped as sub-central ecotope due to vegetation interpretation differences between the two surveys; it is now mapped as active flush (**X2**). See discussion of **X2** below for more details. Two points in the north of the former **Sc6** are now in an area mapped as sub-marginal ecotope. However, these points were a borderline sub-marginal/sub-central complex at the time (complex 9/7 + My), which would be mapped as sub-marginal ecotope using 2013 criteria.	
Sc7	None	No longer present (increasing)	This is no longer present as it has been amalgamated with the formerly adjacent **Sc2**. See discussion of **Sc2** above for more details.	
Sc8	None	No longer present (stable possibly decreasing)	This area of ARB is no longer present. However, the 'loss' of ARB here is considered to be due to interpretation differences between the 2004 survey and the 2013 survey (as well as the increased mapping accuracy of the 2013 survey) rather than to any real differences on the ground. Yet, it should not be ruled out that there has been a real loss of ARB in this area since there were three sub-central points recorded here in 2004. On the other hand, these points were recorded as poor quality sub-central (complex 3/2/9a + P) and since they were not described, there is insufficient evidence to be certain that there has been a decrease in the extent of ARB here and thus **Sc8** is considered to be stable, possibly decreasing.	
Sc9	Qsc1	No longer present (stable possibly decreasing)	This area of ARB is no longer present. However, the 'loss' of ARB here is considered to be due to interpretation differences between the 2004 survey and the 2013 survey (as well as the increased mapping accuracy of the 2013 survey) rather than to any real differences on the ground. Yet, it should not be ruled out	Slight variation in quadrat data: increase in the pool cover (from 4-10% to 11-25%), in the cover of *S. cuspidatum* (<4% to 4-10%); decrease in the overall *Sphagnum* cover (26-33% to 11-25%)

Area	Quadrats	Trend	Comment	Quadrats analysis
			that there has been a real loss of ARB in this area since there were four sub-central points recorded here in 2004. On the other hand, these points were recorded as poor quality sub-central (complex 9/7 + P) with a maximum *Sphagnum* cover of 30-40%. One sub-central point was taken here in 2013 and described as too small to map. Thus, there is insufficient evidence to be certain that there has been a decrease in the extent of ARB here and hence **Sc9** is considered to be stable, possibly decreasing.	and in the cover of *S. capillifolium* (4-10% to <4%) and *S. papillosum* (4-10% to <4%). These changes may merely be the result of a discrepancy in the quadrat location (up to 2m) between both year surveys, rather than an actual change.
Sc10	None	No longer present (decreasing)	This is no longer mapped as sub-central ecotope due to vegetation interpretation differences between the two surveys; it is now mapped as active flush and inactive flush (**Y4**). See discussion of **Y4** below for more details.	
Sc11	Qsc2	Decreasing	There are changes all around the boundary as a result of the increased mapping accuracy of the 2013 survey resulting in **Sc11** being mapped as smaller than in 2004. Evidence of degradation having taken place here is illustrated by the fact that four sub-central points taken in 2004 now lie outside of the 2013 extent of **Sc11**. The loss of ARB from **Sc11** is estimated to be 0.5ha with most of this loss occurring in the northwest and southeast of the former extent of **Sc11**. Thus **Sc11** is considered to be decreasing with the loss of ARB here most likely due to high bog drainage, particularly from drain complex bJ and drain bY3.	Very slight variation in quadrat data: pool cover (11-25%) and overall *Sphagnum* cover (26-33%) have remained the same, increase in the cover of *S. denticulatum* (absent to <4%); decrease in the cover of *S. capillifolium* (11-25% to 4-10%) and *S. austinii* (<4% to absent). These changes may merely be the result of a discrepancy in the quadrat location (up to 2m) between both year surveys, rather than an actual change.
Sc12	None	No longer present (stable)	This area of ARB is no longer present. However, the 'loss' of ARB here is considered to be due to interpretation differences between the 2004 survey and the 2013 survey (as well as the increased mapping accuracy of the 2013 survey) rather than to any real differences on the ground. Only one sub-central point was recorded here in 2004 and that was classed as a borderline sub-central/sub-marginal complex (9/7/10 + Ph). A sub-marginal point (complex 9/7 + Ph) recorded in 2013 was described as being borderline sub-marginal/sub-central and hence it is likely that vegetation interpretation differences are	

Area	Quadrats	Trend	Comment	Quadrats analysis
			responsible for the 'loss' of ARB here and thus **Sc12** is considered to be stable.	
Sc13	None	No longer present (decreasing)	This area of ARB is no longer present. Evidence of degradation having taken place here is illustrated by the fact that there were three sub-central points (complex 9/7/10 RB) taken in 2004. The loss of ARB from **Sc13** is estimated to be 0.66ha. Thus **Sc13** is considered to be decreasing with the loss of ARB here most likely due to high bog drainage, particularly from drains bO and bN1 (water flow was recorded in both these drains during the 2013 survey) and drainage complex bC, but may also be at least partially attributed to the ongoing peat cutting to the ENE.	
Sc14	None	Newly recorded (unknown)	This is a newly recorded area of sub-central ecotope and was recorded as a result of the 2013 survey being more comprehensive with an increased mapping accuracy than that of the 2004 survey.	
Sc15	None	Newly recorded (unknown)	This is a newly recorded area of sub-central ecotope and was recorded as a result of the 2013 survey being more comprehensive with an increased mapping accuracy than that of the 2004 survey.	
Sc16	None	Newly recorded (unknown)	This is a newly recorded area of sub-central ecotope and was recorded as a result of the 2013 survey being more comprehensive with an increased mapping accuracy than that of the 2004 survey.	
Sc17	None	Decreasing	This was formerly mapped as part of **Sc1**. See discussion of **Sc1** above for more details.	
Sc18	None	Decreasing	This was formerly mapped as part of **Sc3**. See discussion of **Sc3** above for more details.	
Sc19	None	Newly recorded (unknown)	This is a newly recorded area of sub-central ecotope and was recorded as a result of the 2013 survey being more comprehensive with an increased mapping accuracy than that of the 2004 survey.	
Sc20	None	Newly recorded (unknown)	This is a newly recorded area of sub-central ecotope and was recorded as a result of the 2013 survey being more comprehensive with an increased mapping accuracy than that of the 2004 survey.	

Area	Quadrats	Trend	Comment	Quadrats analysis
Sc21	None	Newly recorded (unknown)	This is a newly recorded area of sub-central ecotope and was recorded as a result of the 2013 survey being more comprehensive with an increased mapping accuracy than that of the 2004 survey.	
A	None	Newly recorded (unknown)	This is a newly recorded area of active flush and was recorded as a result of the 2013 survey being more comprehensive with an increased mapping accuracy than that of the 2004 survey.	
G	None	Newly recorded (unknown)	This is a newly recorded area of active flush and was recorded as a result of the 2013 survey being more comprehensive with an increased mapping accuracy than that of the 2004 survey.	
X	None	No longer present (Stable - possibly decreasing)	Four separate small areas of ARB were mapped in 2004 within flush **X**, located in lobe eight of the high bog. These areas of ARB are no longer present. However, the 'loss' of ARB here is considered to be due to interpretation differences between the 2004 survey and the 2013 survey (as well as the increased mapping accuracy of the 2013 survey) rather than to any real differences on the ground. Indeed one of the active flush polygons had no points taken within it in 2004, while another had only one (the others having 3 and 4 respectively). Furthermore, there are no descriptions of these areas and hence there is insufficient evidence to be certain that there has been a decrease in the extent of ARB here and thus ARB within flush **X** is considered to be stable, possibly decreasing.	
X2	None	Stable	There are changes all around the boundary as a result of the increased mapping accuracy of the 2013 survey resulting in **X2** being mapped as larger than in 2004. The size and shape of **X2** mapped in 2013 is extremely different from that of 2004 due also to vegetation interpretation differences between the two surveys with part of what was mapped as **Sc6** in 2004 mapped as active flush in 2013. Nevertheless, the extent of **X2** is considered to have remained stable.	
X3	None	Stable	Located in lobe three of the high bog. This is a small *Sphagnum*-filled pool found close to drain bC24 within a much larger area of inactive flush, **X3**. The area	

Area	Quadrats	Trend	Comment	Quadrats analysis
			of the pool was estimated at 10m x 7m in both surveys and thus the ARB within **X3** is considered to be stable.	
W2	None	Stable	There are slight changes all around the boundary as a result of the increased mapping accuracy of the 2013 survey resulting in **W2** being mapped as slightly larger than in 2004. Hence, the extent of **W2** is considered to be stable.	
Y2	None	Stable	There are changes all around the boundary as a result of the increased mapping accuracy of the 2013 survey resulting in **Y2** being mapped as larger than in 2004. The size and shape of **Y2** mapped in 2013 is extremely different from that of 2004 due also to vegetation interpretation differences between the two surveys with part of what was mapped as **Sc1** in 2004 mapped as active flush in 2013. Nevertheless, the extent of **Y2** is considered to have remained stable.	
Y3	None	No longer present (stable)	This area of ARB is no longer present. However, the 'loss' of ARB here is considered to be due to interpretation differences between the 2004 survey and the 2013 survey (as well as the increased mapping accuracy of the 2013 survey) rather than to any real differences on the ground. Only one active flush point was taken here in 2004 and this was recorded where the double drain b3E crosses through the flush. An active flush point was also taken here in 2013, but described as too small to map. Hence, the extent of ARB within **Y3** is considered to be stable.	
Y4	Qaf1	Decreasing	There are changes all around the boundary as a result of the increased mapping accuracy of the 2013 survey resulting in **Y4** being mapped as much larger than in 2004. The size and shape of **Y4** mapped in 2013 is extremely different from that of 2004 due also to vegetation interpretation differences between the two surveys with part of what was mapped as **Sc10** in 2004 mapped as active flush in 2013 and part of it mapped as inactive flush (and also labelled **Y4**). However, the combined area of former **Sc10** and the former extent of active flush in **Y4** are much smaller than the extent of active flush mapped within **Y4** in 2013. However, the loss of ARB here is difficult to estimate since a large part of it is due to vegetation interpretation differences between the two surveys illustrated by the fact that the southern	Newly recorded quadrat

Area	Quadrats	Trend	Comment	Quadrats analysis
			'half' of the former **Sc10** is now mapped as active flush (although described as being similar to the sub-central complex 9/7/10) while the northern 'half' is now mapped as inactive flush (although described as being similar to the sub-marginal complex 9/7). The difference between the two was considered subtle and it was noted that mapping a boundary between the two was difficult. Indeed in 2004, **Sc10** was classed as complex 9/7 + Empetrum, a borderline sub-marginal/sub-central complex and it was noted that the north of the area had some lower quality sub-marginal patches. Thus, although there is 5ha less of ARB mapped in this area in 2013 than in 2004, it is estimated that only 25% of this difference is real with the remainder attributed to interpretation and mapping differences. Nevertheless, the ARB within **Y4** is considered to be decreasing with the loss of ARB here most likely due to high bog drainage, particularly from drains bC24, b4H and b4H1-5, but may also be at least partially attributed to the ongoing peat cutting to the north and north-east.	
Z	None	No longer present (Decreasing)	This area of ARB is no longer present although two ARB points (too small to map) were taken in 2013. The degradation of this area is also illustrated by the loss of the open water pool, which lay to the north of the area formerly mapped as active flush. Hence, the area of ARB within flush **Z** is considered to be decreasing with the loss of ARB here most likely due to high bog drainage, particularly from drain bB1 in which a very fast flow of water was recorded during the 2013 survey.	

Degraded Raised Bog (7120)

Area

The Degraded Raised Bog FRV for Area is 639.13ha at Bellanagare Bog. This value corresponds with the difference between the current high bog area (878.9ha) and the Active Raised Bog FRV (239.77ha) 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 29.76% bigger than FRV. Any habitat Area value more than 15% above FRV falls into the **Unfavourable Bad** assessment category, and therefore that is the assessment that applies to DRB habitat Area for Bellanagare (see table 8.4).

Table 8.3 indicates that there has been a decrease (2.56ha) in the area of Degraded Raised Bog. The decrease is the result of a high bog loss of 5.77ha caused by peat cutting coupled with an increase (3.21ha) in DRB from the degradation of ARB. As a result the habitat is given a **Decreasing** trend.

The Area of Degraded Raised Bog at Bellanagare 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 207.33ha (25% of 829.31ha, the current area of Degraded Raised Bog). The current marginal and face bank ecotopes area value (378.09ha) is 82.36% 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 that there has been a decrease in the area of marginal ecotope of 3.87ha and a decrease in the area of face-bank ecotope of 0.90ha. Although table 8.3 shows a net increase in the area of inactive flush of 0.50ha, brought about by losses of active flush, 1ha of inactive flush been lost to peat cutting. These decreases were brought about only by the loss of high bog to peat cutting rather than the re-wetting of DRB. 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 Bellanagare 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 sub-marginal ecotope.

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

Future Prospects

The area of Degraded Raised Bog has decreased by 2.56ha as a consequence of a high bog loss of 5.77ha caused by peat cutting coupled with an increase (of 3.21ha) in DRB from the degradation of ARB. Peat cutting continues at the site according to the most recent 2013 NPWS data. Drainage on the high bog and within the cutover continues to damage the habitat and hinder its recovery to FRVs, as well as minimising the chances of converting marginal and facebank ecotopes to sub-marginal and/or Active Raised Bog. In addition no remediation works were carried out during the reporting period at the site that might contribute to the restoration of good quality habitat. Habitat **Area** is currently 29.76% above FRV (see table 8.4) and a Decreasing trend is expected in the following two reporting periods (12 years) due to further 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 82.36% 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**.

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

Table 8.3 Changes in Degraded Raised Bog area

Inactive Ecotopes	**1994/5[1]**	**2004**	**2004 (amended)**	**2013**	**Change (2004-2013)**	
	Area (ha)	**Area (ha)**	**Area (ha)**	**Area (ha)**	**Area (ha)**	**%**
Sub-marginal	147.91	249.78	321.96	323.82	(+)1.86	(+)0.58
Marginal[2]	474.12	399.15	371.17	367.30	(-)3.87	(-)1.04
Face bank[2]	na	7.49	11.69	10.79	(-)0.90	(-)7.70
Inactive flush	123.07	111.15	117.62	118.12	(+)0.50	(+)0.43
Conifer plantation	17.01	18.02	9.25	9.25	0.00	0.00
Open water	na	0.20	0.18	0.03	(-)0.15	(-)83.33
Total	**762.11**	**785.79**	**831.87**	**829.31**	**(-)2.56**	**(-)0.31**

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

[2] Any 2013 marginal and face bank ecotope value given within the report should be taken as a maximum value. Their extent is based on the 2013 habitat survey and 2010 aerial photographs. It cannot be ruled out that further marginal and/or face bank ecotope losses may have taken place at the margin of the high bog in the 2011-2012 period associated with peat cutting.

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

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

Depressions on peat substrates of the Rhynchosporion (7150)

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

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

The Area trend assessment is based on the variation on Active Raised Bog and sub-marginal ecotope within Degraded Raised Bog in the reporting period. The area of Active Raised Bog has decreased in the reporting period (by 3.21ha) while the area of sub-marginal ecotope has increased (by 3.11ha) resulting in a very small decrease 0.1ha (0.03%) in suitable habitat for Rhynchosporion depressions. 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. Logically this has to have a long term negative effect on Rhynchosporion depressions. 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 Bellanagare 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]	2013 value (ha) [2]	% below target	FRV 2013 Target (ha) [3]	2013 value (ha) [4]	% below target
7110	239.77	49.59	79.32	24.80	11.32	54.35

[1] 1994/5 central, sub-central, active flush, bog woodland and sub-marginal ecotope area.

[2] 2013 central, sub-central ecotope, active flush and bog woodland area.

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

[4] 2013 central ecotope and active flush area.

	FRV Target (ha) [5]	2013 value (ha) [6]	% above target	FRV 2013 Target (ha) [7]	2013 value (ha) [8]	% above target
7120	639.13	829.31	29.76	207.33	378.09	82.36

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

[6] 2013 Degraded Raised Bog area.

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

[8] Current marginal and face bank ecotopes area.

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

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

Table 8.5 Habitats conservation status assessments

Habitat	Area Assessment	Structure & Functions Assessment	Future Prospects Assessment	Overall Assessment
7110	Unfavourable Bad-Decreasing	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 still continues at the site and has taken place at 102 locations in the 2005-2010 reporting period. At least 5.77ha of high bog have been lost in reporting period due to peat cutting and this activity is considered to be one of the reasons for the decrease in area of Active Raised Bog and the decrease and decline of Degraded Raised Bog. 34 plots were recorded as being actively cut in 2010/11. The activity has continues in 2013 according to the most recent NPWS data.
- Over 11km of drains on the high bog remain unblocked and functional and a further 13km are classed as unblocked reduced functional. Significant water losses were recorded during the survey through a number of drains including drain bB1 on lobe 8 (where drainage is attributed to the loss of ARB from flush **Z**), drain bC (where it is not blocked in its northern-most extent at the very west of lobe 10), drains mK and bR on lobe 9 and drain b3D on lobe 5. Furthermore, over 1km of blocked drains are still considered as functional and over 34km considered reduced functional. No drain blocking was carried during the reporting period and at least one of previously blocked drain (drain bD) was reopened.
- 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-east (lobe 10); east (lobe 1); south-east (lobe 2) and west of the high bog (lobe 3&4).
- No fire events occurred on the high bog in the reporting period with the last recorded one affecting lobes 5, 6, 7, 8, 9 and 10 in 2003/04, damaging 24% of the high bog area.
- There are four blocks of conifer plantations measuring a total of 9.5ha in extent on the high bog at Bellanagare; two on Lobe 2 and one on each of Lobes 3 and 4. There are also conifer plantations on adjacent cutover bog to the north-west (adjacent to Lobe 9 measuring 24ha), to the north-east (adjacent to Lobes 9 and 10 measuring 35ha), to the east (adjacent to Lobe 7 measuring 8ha), to the south-west (adjacent to Lobes 2 and 3 measuring 45ha) and to the west (adjacent to Lobe 7 measuring 20ha).

Changes in active peat forming areas

- There has been a decrease (3.21ha) in the extent of Active Raised Bog habitat on Bellanagare from 2004 to 2013. Most of this loss has been from sub-central ecotope (3.11ha; 1.25ha from former **Sc10** on lobe 1; 0.85ha from **Sc1** on lobe 7; 0.5ha from **Sc3** and 0.35ha from **Sc5** on lobe 6; 0.66ha from former **Sc13** on lobe 10 and 0.5ha from **Sc11** on lobe 4) with a 0.10ha of active flush lost (from **Z** on lobe 8). The gross decrease recorded in extent was actually higher (4.36ha), but this was balanced somewhat by small (1.15ha) expansions of ARB in **Sc1** on lobe7 and **Sc2** on lobe 5 brought about by the blocking and/or infilling of drains. There have also been some changes to the distribution of the habitat as a result of the 2013 survey being more comprehensive than previous ones.
- The expansion of sub-central ecotope in lobe 5 has resulted in the amalgamation of former **Sc2** and **Sc7** into one larger area of **Sc2**.
- There are two newly recorded areas of central ecotope; **C1** and **C2** on lobe 5. These are likely to be the result of the 2013 survey being more comprehensive than that of the 2004. However, limited evidence suggests that there has been an improvement in the quality of ARB here brought about by the infilling of drains (particularly drain b3E).
- Several new peat forming areas including sub-central ecotope (**Sc15** and **Sc16** in lobe 2, **Sc14**, **Sc19** and **Sc20** in lobe 3 and **Sc21** in lobe 10) and active flush (flush **A** on lobe 10 and flush **G** on lobe 7) have been described at the site. These new areas are the result of a more comprehensive survey in 2013 rather than actual changes in Active Raised Bog.
- There are a number of areas (**Sc8, Sc9** and **Sc12** as well as flushes **X** and **Y3**) that were formerly classed as ARB that are no longer classed as such, but the change is considered to be due to interpretation differences rather than to an actual change on the ground. However, it should be noted that **Sc8**, **Sc9** and **X** did display some evidence (though an insufficient amount to be certain) of degradation.
- Two former areas of sub-central ecotope have been re-interpreted as active flush (former **Sc6** now part of **X2**; and part of former **Sc10** now part of **Y4**).
- There are slight changes around the boundary of the remaining active areas period (**Sc4** in lobe 6**, X2**, **Y2** and **W2** in lobe 7 and **X3** in lobe 3), but these are considered to be as a result of the increased mapping accuracy of the 2013 survey. These areas are considered as have remained stable during the reporting.

Other changes

- There have been numerous revisions of ecotope boundaries of marginal/sub-marginal on the high bog resulting from more comprehensive surveying, and differences in the interpretation of habitats.
- The boundaries of the inactive flushes **R1**, **R2**, **R3**, **U2**, **V2**, **W3**, **X**, **X3**, **X4**, **Y**, **Y3**, **Z**, **Z2**, **Z3**, **Z4** and **Z5** have been slightly modified, also as a result of more comprehensive surveying.
- Several small inactive flushes (**B**, **C**, **D**, **E**, **F**, **X5** and **W4**) have been newly mapped and described but these new areas are the result of the 2013 survey being more comprehensive than actual changes on the high bog.

Quadrats analysis

- **Qsc1**: Greater cover of pools in 2013; lower overall *Sphagnum* cover; higher cover of *S. cuspidatum*; lower cover of *S. papillosum* and *S. capillifolium*; higher cover of *Calluna vulgaris*; slightly lower cover of *Trichophorum germanicum*, *Narthecium ossifragum*, *Rhynchospora alba* and *Cladonia portentosa*. All differences likely to be due to a potential minor difference in quadrat location and/or vegetation interpretation.
- **Qsc2**: Higher cover of *S. denticulatum* in 2013; lower cover of *S. austinii* and *S. capillifolium*; slightly higher cover of *Calluna vulgaris* and *Cladonia portentosa*; slightly lower cover of *Trichophorum germanicum*, *Narthecium ossifragum* and *Rhynchospora alba*. All differences likely to be due to a potential minor difference in quadrat location and/or vegetation interpretation.
- **Qsc3**: Lower cover of pools in 2013; higher cover of *S. papillosum*; lower cover of *S. austinii* and *S. capillifolium*; higher cover of *Calluna vulgaris* and *Cladonia portentosa*; lower cover of *Trichophorum germanicum*, *Narthecium ossifragum* and *Rhynchospora alba*. Some differences likely to be due to a potential minor difference in quadrat location and/or vegetation interpretation. However, some of the differences (e.g. the large decrease in the cover of *Narthecium ossifragum* and the large increase in the cover of *Calluna vulgaris*) are likely to be due to the fact that the vegetation had been burned 1-2 years prior to 2004 and thus the vegetation is recovering from that fire.

Restoration works

- No restoration works have been undertaken at the site during the reporting period, but over 35km of drains were blocked and at least 149ha of bog bought as part of a restoration programme in the late 1990s.

- NPWS has engaged in negotiation with landowners in relation to the cessation of peat cutting at the site. Despite negotiations peat cutting continues at Bellanagare.

Summary of conservation status

- **Active Raised Bog** has been given an **Unfavourable Bad–Declining** conservation status at Bellanagare Bog. Habitat' Area has decreased (by 3.21ha or 6.08%) while the quality has remained Stable during the reporting period. However both values are substantially below the FRVs. Future Prospects are considered Unfavourable Bad-Declining as impacting activities (peat cutting and drainage) continue to threaten the habitat.
- **Degraded Raised Bog** has been given an **Unfavourable Bad-Declining** conservation status at Bellanagare Bog. Habitat' Area has decreased due to peat cutting and is substantially above the FRV. Habitat's S&Fs have remained Stable. 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 Bellanagare Bog. Habitat' Area and quality (S&Fs) are considered to have remained relatively Stable during 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 **Bellanagare SAC** is assessed as being **Unfavourable Bad-Declining**.

Recommendations

- **Cessation of peat cutting.**
- **Restoration works** including the blocking of remaining unblocked high bog functional and reduced-functional drains. With over 11km of functional drains (as well as 13km of unblocked reduced functional) on the high bog, there is potential for the development of Active Raised Bog as a result of the blocking of these drains
- **Further restoration works** recommended include the removal of the conifer plantations (and the blocking of associated drains) from the high bog and from the cutover.
- **The blocking of cutover drains** is also to be recommended. There is potential for the restoration of cutover around the entire site. This may be particularly important as reaching the ARB target on the high bog alone may not be achievable.

- **Further hydrological and topographical studies** to ascertain the capacity of the high bog to support Active Raised Bog and thus estimate a more accurate favourable reference value.
- **Further botanical monitoring surveys** on the high bog in order to assess changes in the conservation status of habitats, and also potentially, monitoring surveys of cutover areas if they become part of future restoration programmes at the site.

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Appendix I Detailed vegetation description of the high bog

Active Raised Bog (7110)

Central Ecotope Complex

COMPLEX 35

- **Location**: this complex characterizes **C1** and **C2** and was also found scattered within small areas of **Sc1**
- **Ground**: soft (quaking in places)
- **Physical indicators**: absent
- ***Calluna* height**: 11-20cm
- ***Cladonia* cover**: 4-10%
- **Macro-topography**: gentle slope (partial depression)
- **Pools**: 26-33% (34-50% in places)
- ***Sphagnum* cover**: 34-50% (51-75% in places)
- ***Narthecium* cover**: <4% (4-10% in places)
- **Micro- topography**: Hummocks/hollows, lawns and pools
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (11-25%; 26-33% in places), *Erica tetralix* (<4%), *Eriophorum angustifolium* (4-10%), *E. vaginatum* (<4%; 4-10% in places), *Rhynchospora alba* (<4%; 4-10% in places), *Carex panicea* (<4%), *Narthecium ossifragum* (<4%), *Trichophorum germanicum* (<4%), *Menyanthes trifoliata* (<4%), *Drosera anglica* (<4%), *Sphagnum capillifolium* (H; 11-25%; 4-10% in places), *S. austinii* (H; <4%), *S. tenellum* (H; <4%), *S. papillosum* (H & L; 11-25%), *S. denticulatum* (P; <4%), S. *cuspidatum* (P; 11-25%; 26-33% in places), *Campylopus atrovirens* (<4%), *Racomitrium lanuginosum* (<4%), *Dicranum scoparium* (<4%), *Hypnum jutlandicum* (4-10%), *Cladonia portentosa* (4-10%), *C. uncialis* (<4%).
- **Additional comments:** This description was taken in **C1** in lobe 5 where it was surrounded by the sub-central complex 9/7 + P. As it grades into sub-central there is a decrease in pool and *Sphagnum* cover and an increase in *Carex panicea* and *Narthecium ossifragum*.

Sub-Central Ecotope Complexes

COMPLEX 4/10

- **Location**: **Sc21** surrounding flush A within lobe 10, dominating western and southern sections of **Sc1** and northern section of **Sc17** within lobe 7
- **Ground**: very soft
- **Physical indicators**: absent
- ***Calluna* height**: 11-20cm
- ***Cladonia* cover**: 4-10%
- **Macro-topography**: gentle slope
- **Pools**: 4-10% (but not well defined, sometimes more like *Sphagnum*-filled lawns and *Rhynchospora* dominated depressions)
- ***Sphagnum* cover**: 34-50% (51-75% in places)
- ***Narthecium* cover**: <4% (4-10% in places)
- **Micro- topography**: low hummocks/hollows, lawns and pools
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (11-25%), *Erica tetralix* (<4%), *Eriophorum angustifolium* (4-10%; 11-25% in places), *E. vaginatum* (4-10%), *Rhynchospora alba* (4-10%; 11-25% in places), *Carex panicea* (<4%), *Narthecium ossifragum* (<4%), *Trichophorum germanicum* (<4%), *Sphagnum capillifolium* (H; 4-10%), *S. austinii* (H; <4%), *S. papillosum* (H & L; 11-25%), *S. magellanicum* (L; 4-10%), S. *cuspidatum* (Hl & P; 4-10%), *Cladonia portentosa* (4-10%).
- **Additional comments:** This description was taken in lobe 10 (**Sc21**) where this sub-central complex grades into the sub-marginal complex 9/7/4. The difference between the two essentially being that the depressions in 9/7/4 have a much lower *Sphagnum* cover.

  This complex is also found in lobe 7 (**Sc1** and **Sc17**) where there is a lower cover of *Eriophorum angustifolium* (<4%) and *S. magellanicum* (<4%) and a higher cover of *S. tenellum* (H; 4-10%; higher in places) and *S. capillifolium* (H; 11-25%).

COMPLEX 6/4 + P

- **Location**: dominating eastern and middle sections of **Sc1** and southern section of **Sc17** within lobe 7; eastern section of **Sc2** in lobe 5
- **Ground**: soft
- **Physical indicators**: absent
- ***Calluna* height**: 11-20cm
- ***Cladonia* cover**: <4%

- **Macro-topography**: gentle slope
- **Pools**: 11-25% (4-10% in places)
- ***Sphagnum* cover**: 34-50% (51-75% in places)
- ***Narthecium* cover**: 4-10% (11-25% in places)
- **Micro- topography**: Low hummocks/hollows, lawns and pools
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (11-25%; 26-33% in places), *Erica tetralix* (<4%), *Eriophorum angustifolium* (<4%; 4-10% in places), *E. vaginatum* (4-10%), *Narthecium ossifragum* (4-10%), *Rhynchospora alba* (11-25%; 4-10% in places), *Carex panicea* (<4%; 4-10% in places), *Trichophorum germanicum* (<4%; 4-10% in places), *Sphagnum capillifolium* (H; 4-10%), *S. austinii* (H; <4%), *S. fuscum* (H; <4%), *S. papillosum* (H, Hl & P; 26-33%; 11-25% in places), *S. magellanicum* (L; <4%), *S. pulchrum* (L & P; <4%; 4-10% in places), *S. cuspidatum* (Hl & P; 4-10%), *Cladonia portentosa* (<4%), *C. uncialis* (<4%), *Racomitrium lanuginosum* (<4%; 4-10% in places), *Campylopus atrovirens* (<4%).
- **Additional comments:** This description was taken in **Sc1** in lobe 7 where this sub-central complex grades into the sub-marginal complex 9/7/4. The difference between the two essentially being that the depressions in 9/7/4 have a much lower *Sphagnum* cover. *Carex panicea* and *Narthecium ossifragum* also tend to be more abundant in 9/7/4. *Sphagnum pulchrum* is particularly abundant in the north-west of **Sc1**. The quality of Active Raised Bog within **Sc1** is variable with small areas of a good enough quality to be considered Central ecotope (complex **35**) present in places, but considered too small to map and other areas of a poor enough quality to be considered sub-marginal ecotope (complex 9/7/4). Some of these areas are also considered too small to map (although points were taken) although other areas of sub-marginal ecotope were mapped out of the area that was mapped as **Sc1** in 2004.

  This complex is also found in lobe 2 (**Sc15** & **Sc16**) where there is less *Racomitrium lanuginosum* and *Narthecium ossifragum* but more *Eriophorum angustifolium*. *Sphagnum denticulatum* is present in the pools. Here the complex grades into the sub-marginal complex 6/3/9 + P, which has a higher cover of *Carex panicea*, a lower *Sphagnum* cover and is firmer underfoot.

  This complex is also found in a small area of lobe 3 (**Sc14**) where there is a higher cover of *Cladonia portentosa* (4-10%; 11-25% in places) and a lower cover of *Sphagnum papillosum* (4-10%).

  This complex is also found in lobe 6 (**Sc5**), where it the area of sub-central mapped is much reduced in comparison to 2004. The retained portion of **Sc5**, i.e. the new smaller area of **Sc5** has a *Sphagnum* cover of 50-70%. *Rhynchospora alba* is very common and wasn't mentioned in

relation to this area in 2004. This may indicate that the area has changed somewhat and that it may be getting dryer. There is a small amount of *Molinia caerulea* scattered through **Sc5** (both in the new area and larger old area), but it is only a minor element of vegetation. A small amount of *Aulacomnium palustre* is also present towards edge of **Sc5**.

Quadrat **Qsc3** was recorded within this complex within **Sc1** on lobe 7.

COMPLEX 6/9A+P

- **Location**: **Sc19** (sub-central area east of W3) in lobe 3
- **Ground**: soft to very soft
- **Physical indicators**: no
- ***Calluna* height**: 21-40cm
- ***Cladonia* cover**: 26-33%
- **Macro-topography**: depression at the base of a steep slope
- **Pools**: 30%, interconnecting
- ***Sphagnum* cover**: 51-75%
- ***Narthecium* cover**: 11-25%
- **Micro-topography:** low hummock, hollows, pools
- **Tussocks:** none
- **Degradation or regeneration evidence**: no
- **Species cover**: *Calluna vulgaris* (11-25%), *Eriophorum angustifolium* (11-25%), *Carex panicea* (11-25%), *Narthecium ossifragum* (11-25%), *Cladonia portentosa* (26-33%), *Trichophorum germanicum* (4-10%), *Drosera anglica* (<1%), *Sphagnum capillifolium* (11-25%), *S. papillosum* (4-10%), *S. cuspidatum* (26-33%), *S. magellanicum* (<4%).
- **Additional comments**: this complex was found only in the sub-central **Sc19**, a small area of Active Raised Bog in a depression at the base of a steep slope in lobe 3. Interconnecting pools, most of which had a very high cover of *S. cuspidatum*, comprised approximately 30% of the total area. *S. papillosum* and *S. magellanicum* were present at pool edges and in low hummocks, while S. *capillifolium* accounted for most of the *Sphagnum* hummocks in the inter-pool areas. *Eriophorum angustifolium* was present in pools and in the wetter inter-pool areas. Some of the inter-pool habitat was of lesser quality, and these areas were generally characterised by a higher cover of *Narthecium ossifragum* and *Carex panicea*.

COMPLEX 9/7/4 + P

- **Location**: this complex characterises **Sc3**, **Sc4** and **Sc18** within lobe 6

- **Ground**: soft to very soft
- **Physical indicators**: no bare peat; old burn indications (low *Calluna* height; low *Cladonia* cover)
- ***Calluna* height**: 21-30cm
- ***Cladonia* cover**: <4% (4-10% in places)
- **Macro-topography**: gentle slope
- **Pools**: 11-25% (4-10% in places)
- ***Sphagnum* cover**: 34-50% (51-75% in places)
- ***Narthecium* cover**: 4-10% (<4% in places)
- **Micro- topography**: Low hummocks/hollows, flats and pools
- **Tussocks**: *Trichophorum germanicum* (<4%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (11-25%; 25-33% in places), *Eriophorum vaginatum* (11-25%; 4-10% in places), *E. angustifolium* (4-10%), *Rhynchospora alba* (4-10%; 11-25% in places), *Carex panicea* (4-10%; <4% in places), *Narthecium ossifragum* (4-10%; <4% in places), *Trichophorum germanicum* (<4%), *Hypnum jutlandicum* (<4%), *Pleurozia purpurea* (<4%), *Campylopus atrovirens* (<4%), *Sphagnum papillosum* (H & P; 11-25%), *S. tenellum* (H; <4%), *S. austinii* (H; <4%), *S. capillifolium* (H; 4-10%), *S. cuspidatum* (P; 11-25%).
- **Additional comments:** The description above was taken in **Sc4** where some of the pools had a substantial cover of *S. cuspidatum*, while others had more open water. *Drosera anglica* was present in pools, while occasional *Sphagnum austinii* hummocks were recorded. **Sc3** and **Sc18** are similar to **Sc4**, but are slightly more degraded with a slightly lower *Sphagnum* cover (34-50%) particularly in relation to *S. cuspidatum* (4-10%; higher in places) and *S. papillosum* (4-10%; higher in places).

Quadrat **Qsc4** was recorded within this complex within **Sc4** on lobe 6.

COMPLEX 9/7 + P

- **Location**: west of **Sc2**, dominating **Sc11** within lobe 4 and **Sc20** in lobe3
- **Ground**: soft
- **Physical indicators**: absent
- ***Calluna* height**: 21-30cm
- ***Cladonia* cover**: 4-10%
- **Macro-topography**: gentle slope
- **Pools**: 4-10% (11-25% in places)
- ***Sphagnum* cover**: 26-33% (34-50% in places)

- ***Narthecium* cover**: <4%
- **Micro- topography**: Low hummocks/hollows, flats and pools
- **Tussocks**: *Trichophorum germanicum* (<4%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (26-33%), *Eriophorum vaginatum* (4-10%), *E. angustifolium* (4-10%; 11-25% in places), *Narthecium ossifragum* (<4%), *Carex panicea* (<4%; 4-10% in places), *Trichophorum germanicum* (<4%), *Drosera anglica* (<4%), *Sphagnum capillifolium* (H; 4-10%), *S. papillosum* (H & Hl; 11-25%), *S. tenellum* (H; <4%), *S. austinii* (H; <4%), *S. cuspidatum* (P; 4-10%), *S. denticulatum* (<4%), *Cladonia portentosa* (4-10%), *Racomitrium lanuginosum* (4-10%; 11-25% in places).
- **Additional comments:** The description above was taken in lobe 4 (**Sc11**). This complex is a borderline sub-central/sub-marginal type complex and it grades into the more degraded sub-marginal complex 9/7/3 + P in places where there is a decrease in pool and *Sphagnum* cover and an increase in *Narthecium ossifragum*, *Carex panicea* and *Trichophorum germanicum*.

  This complex is also present in a very small area of lobe 3 (**Sc20**). Here there is a much higher cover of *Cladonia portentosa* (34-50%). The pools here appear to have dried out somewhat so that they are more like *Sphagnum*-filled depressions and these grade into *Narthecium* dominated depressions as the complex grades into sub-marginal ecotope. Overall, the area mapped as sub-central here is considered to be borderline sub-marginal/sub-central ecotope. Differences noted to the species covers recorded above for lobe 4 include: *Eriophorum angustifolium* (<4%), *Narthecium ossifragum* (4-10%), *Cladonia uncialis* (<4%), *Sphagnum papillosum* (4-10%), *S. magellanicum* (<4%), *S. denticulatum* (absent). The hummocks of *S. austinii* recorded here were considered to be relic hummocks.

  A small area of this complex was also present in the area of former **Sc9** that is now deemed too small to map. This area sloped to the north and has a higher cover of *Trichophorum germanicum* (4-10%) while *Rhynchospora alba* was often present at the pool edges. *Drosera anglica* and *Menyanthes trifoliata* were frequently present in pools and *Campylopus atrovirens* occasional at pool edges. *Pleurozia purpurea* was present but rare. Only one sub-central point was taken here in 2013, and that point was considered to be borderline sub-marginal/sub-central ecotope with a *Sphagnum* cover of ca. 25% composed mostly of *S. magellanicum*. However, although four sub-central points were taken here in 2004, it is considered unlikely that the area has degraded as the description taken at that time indicates that is was already considered a borderline sub-marginal/sub-central complex at that time with the overall *Sphagnum* cover estimated to be

"30-40% maximum" with the quadrat taken in 2004 indicating a 30% cover composed mostly of *S. magellanicum*, *S. papillosum* and *S. capillifolium*.

Quadrat **Qsc1** and **Qsc2** were recorded within this complex in the area of former **Sc9** on lobe 3 and within **Sc11** on lobe 4.

Active flushes

FLUSH A

- **Location**: east of lobe 10
- **Ground**: soft (quaking in north-east)
- **Physical indicators**: absent
- ***Calluna* height**: 41-50cm
- ***Cladonia* cover**: <4%
- **Macro-topography**: flat/partial depression
- **Pools**: absent from west of flush but present in east of flush
- ***Sphagnum* cover:** 34-50% (51-75% in places)
- ***Narthecium* cover**: <4%
- **Micro- topography**: Hummocks/hollows
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (11-25%), *Juncus effusus* (26-33%), *Molinia caerulea* (<4%), *Eriophorum angustifolium* (4-10%), *E. vaginatum* (4-10%), *Vaccinium oxycoccos* (<4%), *V. myrtillus* (<4%), *Empetrum nigrum* (<4%), *Andromeda polifolia* (<4%), *Rubus fruticosus* (<4%), *Pedicularis sylvatica* (<4%), *Carex panicea* (<4%), *Betula pubescens* (<4%), *Dryopteris* sp. (<4%), *Polytrichum commune* (<4%), *P. strictum* (<4%), *Hylocomium splendens* (<4%), *Dicranum scoparium* (<4%), *Aulacomnium palustre* (<4%), *Sphagnum capillifolium* (H; 4-10%), *S. tenellum* (H; <4%), *S. palustre* (H; <4%), *S. papillosum* (H, L & Hl; 11-25%), *S. fallax* (Hl; <4%), *S. magellanicum* (L; <4%), *S. cuspidatum* (P; 11-25).
- **Additional comm*ents:*** This is a small flushed area with its central axis dominated by *Juncus effusus*. The north-eastern end of the flush has a high cover of *Sphagnum cuspidatum* while the *Sphagnum* layer in the south-west is dominated by *S. capillifolium* and *S. papillosum* and also supports *S. fallax* and *S. palustre*. There are a number of large dead tree trunks lying scattered in the east of the flush.

FLUSH G

- **Location**: lobe 7
- **Ground**: soft to very soft
- **Physical indicators**: absent
- ***Calluna* height**: 41-50cm
- ***Cladonia* cover**: <4%
- **Macro-topography**: flat/gentle slope
- **Pools**: absent
- ***Sphagnum* cover:** 51-75% (34-50% in places)
- ***Narthecium* cover**: <4%
- **Micro- topography**: Hummocks/hollows
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (51-75%), *Molinia caerulea* (<4%; locally higher), *Eriophorum angustifolium* (<4%), *E. vaginatum* (11-25%), *Vaccinium oxycoccos* (<4%), *Andromeda polifolia* (<4%), *Carex panicea* (<4%), *Polytrichum strictum* (<4%), *Aulacomnium palustre* (<4%), *Sphagnum capillifolium* (H; 34-50%), *S. tenellum* (H; <4%), *S. papillosum* (H & Hl; 4-10%), *S. cuspidatum* (Hl; <4%).
- **Additional comm*ents:*** This is a small linear flush (8-10m wide) that extends in a WNW/ESE direction. It begins as a circular area of *Molinia caerulea* dominated vegetation to the south of **Sc17** and extends WNW from there. It possibly indicates a flow path and may in fact extend further to the west to link up with flush **X2**.

FLUSH X2

- **Location**: south-west corner of lobe 7
- **Ground**: soft to very soft
- **Physical indicators**: none
- ***Calluna* height**: >60cm
- ***Cladonia* cover**: absent
- **Macro-topography**: along a low ridge, within a depression (possibly an old, infilled drain)
- **Pools**: absent
- ***Sphagnum* cover:** 34-50% (51-75% in places)
- ***Narthecium* cover**: <4%
- **Micro- topography**: Hummocks of tall *Calluna vulgaris*/hollows

- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (34-50%), *Molinia caerulea* (11-25%; 26-33% in places), *Myrica gale* (<4%; scattered throughout), *Eriophorum vaginatum* (4-10%), *Juncus effusus* (<4%), *Salix* sp. (<4%), *Narthecium ossifragum* (<4%), *Hypnum jutlandicum* (<4%), *Sphagnum capillifolium* (H; 34-50%), *S. papillosum* (H & Hl; 4-10%), *S. cuspidatum* (Hl; <4).
- **Additional comments***:* *Molinia caerulea* cover varied somewhat throughout the flush, with occasional small patches having 90%+ cover. Other typical flush species recorded included *Aulacomnium palustre*, *Pleurozium schreberi* and *Andromeda polifolia*. The extent of X2 is now substantially larger than that mapped by Fernandez *et al*. (2005). The current area incorporates parts of the former sub-central, **Sc6**, the remainder of which is now mapped as sub-marginal ecotope.

  In the north-west of this flush there is a small area of pools that has some characteristics that are more of sub-central ecotope (complex 9/7/4 + P) than active flush. The pool cover is 11-25%, but these are often more like *Sphagnum*-filled hollows than well-defined pools. The overall *Sphagnum* cover is 51-75% composed of *S. cuspidatum* (Hl & P; 11-25%), *S. denticulatum* (P; <4%), *S. magellanicum* (H & L; 4-10%), *S. papillosum* (H; 4-10%), *S. capillifolium* (H; 4-10%) and *S. tenellum* (H; <4%). *Calluna vulgaris* (26-33%), *Eriophorum vaginatum* (4-10%) and *Rhynchospora alba* (11-25%) are the most abundant vascular plants. Other species recorded include *Carex panicea* (<4%), *Narthecium ossifragum* (4-10%), *Eriophorum angustifolium* (<4%), *Menyanthes trifoliata* (<4%), *Andromeda polifolia* (<4%), *Hypnum jutlandicum* (<4%) and scattered *Molinia caerulea* (<4%).

FLUSH X3

- This is a largely inactive flush, but there is a small (10m x 7m) *Sphagnum*-filled pool present. *S. cuspidatum* and *S. papillosum* dominate with *S. fallax* present in the south-western end of the pool. *Eriophorum angustifolium* (4-10%) grows in the pool along with *Molinia caerulea*, *Vaccinium oxycoccos*, *Andromeda polifolia*, *Empetrum nigrum* and *Aulacomnium palustre*. The pool is surrounded by vegetation dominated by *Calluna vulgaris* and *Molinia caerulea*. See further description under Degraded Raised Bog.

FLUSH W2

- **Location**: east side of lobe 7, contiguous with **Sc1**
- **Ground**: soft to quaking

- **Physical indicators**: no
- ***Calluna* height**: 41-60cm
- ***Cladonia* cover**: none
- **Macro-topography**: depression
- **Pools**: entire flush is an infilling pool or lake
- ***Sphagnum* cover**: 76-90%
- ***Narthecium* cover**: none
- **Micro-topography:** high hummocks/low hummocks, pools, lawns
- **Tussocks:** none
- **Degradation or regeneration evidence**: no
- **Species cover**: *Calluna vulgaris* (11-25%), *Eriophorum angustifolium* (4-10%), *Aulacomnium palustre* (4-10%), *Molinia caerulea* (<4%), *Sphagnum capillifolium* (11-25%), *S. papillosum* (11-25%), *S. magellanicum* (1-4%), *S. pulchrum* (1-4%), *S. cuspidatum* (51-75%).
- **Additional comments**: this flush was mostly composed of an infilling lake or pool, most of which was covered by *Sphagnum cuspidatum*. *S. papillosum*, *S. magellanicum* and *S. pulchrum* were present in lawns around the pool margins, while *Eriophorum angustifolium* was common throughout the quaking pool. Hummocks of tall *Calluna vulgaris* (up to 60cm in height) were sparsely scattered throughout the flush. *Aulacomnium palustre* was abundant in some places.

FLUSH Y2

- **Location**: lobe 7, west side of **Sc1**
- **Ground**: soft
- **Physical indicators**: charred *Calluna vulgaris* stems from an old burn
- ***Calluna* height**: 41-60cm (occasionally up to 1m)
- ***Cladonia* cover**: <1%
- **Macro-topography**: base of slope from northern side
- **Pools**: none
- ***Sphagnum* cover**: 51-75%
- ***Narthecium* cover**: none
- **Micro-topography:** tall *Calluna* and *Cladonia* hummocks, low *Sphagnum* hummocks
- **Tussocks:** none
- **Degradation or regeneration evidence**: no

- **Species cover**: *Calluna vulgaris* (51-75%), *Molinia caerulea* (11-25%), *Aulacomnium palustre* (<4%), *Hypnum jutlandicum* (<4%), *Juncus effusus* (<1%), *Empetrum nigrum* (<1%), *Vaccinium oxycoccos* (<1%), *Sphagnum capillifolium* (51-75%), *S. papillosum* (4-10%), *S. palustre* (1-4%).
- **Additional comments**: the *Sphagnum* layer in this flush was previously reported to consist mainly of *S. squarrosum* and *S. papillosum* (Fernandez *et al*., 2005). *S. squarrosum* was not recorded in the present survey and it is likely to have been confused in the earlier survey with *S. palustre*, which was recorded here, albeit at relatively low cover. *Sphagnum capillifolium*, which now dominates the *Sphagnum* layer, was not mentioned in the 2005 survey, which seems unlikely to reflect the true situation then, given the widespread and frequent occurrence of this species. In the northern part of the flush, there was a small (c. 10x5m) scrub area, dominated by *Salix* sp., with *Myrica gale*, tall *Calluna vulgaris*, and *Empetrum nigrum* also present. Bryophytes here included *Aulacomnium palustre*, *Hylocomium splendens* and *Calliergonella cuspidata*.
  According to Kelly *et al*. (1995), this flush is associated with local discharge of groundwater, which occurs on a natural slope within the site.

FLUSH Y4

- **Location**: lobe 1
- **Ground**: soft
- **Physical indicators**: burnt/charred *Calluna* stems, *Campylopus introflexus* and *Cladonia floerkeana* (<4%)
- ***Calluna* height**: 21-30cm
- ***Cladonia* cover**: <4% (higher in the south-east)
- **Macro-topography**: flat/gentle slope
- **Pools**: absent
- ***Sphagnum* cover**: 34-50% (26-33% and 51-75% in places)
- ***Narthecium* cover**: <4%
- **Micro- topography:** Hummocks/hollows
- **Tussocks:** absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (34-50%), *Eriophorum vaginatum* (11-25%), *Trichophorum germanicum* (<4%), *Andromeda polifolia* (<4%), *Carex panicea* (<4%; largely absent), *Empetrum nigrum* (<4%), *Vaccinium oxycoccos* (<4%), *V. myrtillus* (<4%), *Aulacomnium palustre* (<4%), *Dicranum scoparium* (<4%), *Polytrichum strictum* (<4%), *Pleurozium schreberi* (<4%), *Hylocomium*

splendens (<4%), *Sphagnum capillifolium* (H; 26-33%), *S. tenellum* (H; <4%), *S. papillosum* (H; <4%), *S. cuspidatum* (Hl; <4%), *Hypnum jutlandicum* (4-10%).

- **Additional comments**: The vegetation here has flush characteristics, but is not a typical wet flush, and has many characteristics both of the sub-central complex 9/7/10 and the sub-marginal complex 9/7. The difference between these two complexes is very subtle and thus mapping a boundary between the two is extremely difficult. A similar difficulty was found here in mapping the boundary between active flush (similar here to 9/7/10) and inactive flush (similar here to 9/7). However, generally within the active flush the *Sphagnum* cover (generally over 50%) and the cover of *Eriophorum vaginatum* are higher while the cover of *Calluna vulgaris* is slightly reduced. Hummocks of *S. austinii* are also present and that of *S. papillosum* are more frequent (4-10% cover) while *S. cuspidatum* is present in hollows.

Quadrat **Qaf1** was recorded within the active part of this flush.

Degraded Raised Bog (7120)

Sub-Marginal Ecotope Complexes

COMPLEX 9/7

- **Location:** area between lobes 7 and 10, surrounding sub-central ecotope areas within lobes 5&6, north and southeast of lobe1, northeast of lobe 2 and northwest of lobe 3
- **Ground**: soft
- **Physical indicators**: *absen*t
- ***Calluna* height**: 31-40cm
- ***Cladonia* cover:** 11-25%
- **Macro-topography**: gentle slope
- **Pools**: absent
- ***Sphagnum* cover**: 34-50%
- ***Narthecium* cover**: <4%
- **Micro- topography** hummocks/hollows
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (34-50%), *Erica tetralix* (<4%), *Eriophorum vaginatum* (4-10%), *E. angustifolium* (<4%; 4-10% in places), *Narthecium ossifragum* (<4%), *Carex panicea* (<4%), *Vaccinium oxycoccos* (<4%), *Trichophorum germanicum* (<4%), *Dicranum scoparium* (<4%), *Hypnum*

jutlandicum (11-25%), *Sphagnum capillifolium* (H; 26-33%), *S. papillosum* (H & Hl; <4%), *S. tenellum* (H; <4%), *S. cuspidatum* (Hl; <4%), *Cladonia portentosa* (11-25%), *C. uncialis* (<4%).

- **Additional comments:** This above description was taken in lobe 10 where the complex also occurs with a higher cover of *Cladonia portentosa* (51-75%) in which case it is termed 9/7 + Cl. These areas generally have a lower *Sphagnum* cover (usually 11-25%). Close to the area of former **Sc13** there are numerous small roughly circular pools (ca. 2-3m diameter) that have developed where peat was excavated for drain blocking. Some of these have a good cover of *Sphagnum cuspidatum* and indications of flushing are also suggested by the presence of *Empetrum nigrum*, *Vaccinium oxycoccos* and *Polytrichum strictum*. The cover of *Eriophorum vaginatum* is high in these areas, but in other pools in this area open water is more prominent and there is a much lower cover of *Sphagnum cuspidatum*. The presence of these artificial pools may skew the interpretation of the vegetation somewhat as they are quite common and this may, at least partially, explain why the area of sub-central (**Sc13**) ecotope was mapped here in 2004. The area of former **Sc13** is often quite wet, but the *Sphagnum* cover is not high (20-30% max.) and there is no diverse micro-topography. Furthermore, the *Sphagnum* cover is composed mostly of *S. capillifolium*, but with some *S. papillosum* also. The area of active flush that was mapped as contiguous with **Sc13** in 2004 is considered inactive and is quite similar to complex 9/7, but with the addition of *Molinia caerulea* which can often be abundant here. Where the blocked drainage complex bC runs through this complex in the west of lobe 10, *Cladonia floerkeana* and *Campylopus introflexus* are occasional to frequent, particularly on the pear dams and around the drains where there is much disturbed ground caused by the peat excavations. Some of the peat dams appear to have some water flow around them, although this is not common. There is also evidence of an old burn (described by Fernandez *et al*., 2005 as having occurred in 2003/04) over much of Complex 9/7 in the west of lobe 10 with some old charred *Calluna* stems. However, there is no significant damage apparent to *Sphagnum* hummock, but *Cladonia portentosa* is still virtually absent from these areas. A 2.5m tall *Rhododendron ponticum* bush is also present in this area. Where complex 9/7 becomes slightly drier, there is usually an increase in the cover of *Narthecium ossifragum* and/or *Carex panicea* and the vegetation is classed as complex 9/7/6 or 9/7/3 respectively. In the better quality areas of complex 9/7, there are very occasional small active hummocks of *Sphagnum austinii*.

  This complex is also found in lobe 2 where there is a higher cover of *Eriophorum vaginatum* (11-25%) and a lower cover of *Cladonia portentosa* (<4%) and *Hypnum jutlandicum* (4-10%). The disturbance indicators *Campylopus introflexus* and *Cladonia floerkeana* are relatively frequent on old burnt tussocks/hummocks in this area and the cover of flush indicator species such as

Vaccinium oxycoccos, *Aulacomnium palustre*, *Dicranum scoparium* and *Polytrichum strictum* is also higher. The complex is borderline sub-central complex 9/7/10 in places north of **Sc15**, but the *Sphagnum* layer is composed almost exclusively of *S. capillifolium*.

This complex is also considered borderline sub-central complex 9/7/10 where it is present close to the inactive flush R3 in lobe 3. The vegetation here grades into R3 so that the differentiation between the two is difficult. Flush indicator species are present within 9/7 including *Vaccinium oxycoccos*, *Aulacomnium palustre*, *Dicranum scoparium* and *Molinia caerulea*. R3 is on ridge so that the surrounding area is on a gentle slope. The species covers are similar to those recorded above for lobe 2, but without the disturbance indicators. The *Sphagnum* cover is >50% in places, but is composed almost exclusively of hummocks of *S. capillifolium*. Where *Phragmites australis* is present the complex is termed 9/7 + Ph and again this complex is considered a borderline sub-central/sub-marginal complex.

This complex is also present to the west of **Sc1** in lobe 7 where there are abundant *Racomitrium lanuginosum* hummocks.

COMPLEX 9/7/4

- **Location**: east of lobe 10,scattered across lobe 7 and southwest of lobe 2
- **Ground**: soft to very soft
- **Physical indicators**: absent
- ***Calluna* height**: 21-30cm
- ***Cladonia* cover**: 4-10%
- **Macro-topography**: flat/gentle slope
- **Pools**: absent (more like *Rhynchospora* dominated depressions)
- ***Sphagnum* cover**: 11-25% (26-33% in places)
- ***Narthecium* cover**: 4-10%
- **Micro- topography**: Hummocks/hollows
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (11-25%), *Erica tetralix* (<4%), *Eriophorum vaginatum* (4-10%), *E. angustifolium* (4-10%; 11-25% in places), *Rhynchospora alba* (4-10%), *Narthecium ossifragum* (4-10%), *Carex panicea* (<4%), *Trichophorum germanicum* (<4%), *Pleurozia purpurea* (<4%), *Sphagnum capillifolium* (H; 4-10%), *S. tenellum* (H; <4%), *S. papillosum* (H & Hl; 4-10%; 11-25% in places), *S. magellanicum* (Hl; <4%), *S. cuspidatum* (Hl; <4%; 4-10% in places), *Cladonia portentosa* (4-10%), *C. uncialis* (<4%).

- **Additional comments:** An old drain runs through this area in lobe 10. This drain is mainly filled with *Sphagnum cuspidatum*, but also supports *S. papillosum*, *Pleurozia purpurea*, *Drosera anglica*, *Eriophorum angustifolium* and *Rhynchospora alba*. This complex grades into the sub-central complex 4/10 in places where the *Sphagnum* cover increases (to 34-50%).

COMPLEX 9/7/6

- **Location**: widespread across lobes 7, 8 & 10, but also scattered across lobes 1, 3 & 5
- **Ground**: soft
- **Physical indicators**: absent
- ***Calluna* height**: 21-30cm
- ***Cladonia* cover**: 4-10% (11-25% in places)
- **Macro-topography**: flat/gentle slope
- **Pools**: absent
- ***Sphagnum* cover**: 11-25%
- ***Narthecium* cover**: 11-25% less in places
- **Micro- topography**: Hummocks/hollows and flats
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (11-25%), *Eriophorum vaginatum* (4-10%), *E. angustifolium* (4-10%; 11-25% in places), *Narthecium ossifragum* (11-25%), *Carex panicea* (4-10%), *Trichophorum germanicum* (<4%), *Rhynchospora alba* (<4%), *Sphagnum capillifolium* (H; 11-25%; 4-10% in places), *S. papillosum* (H & Hl; <4%; 4-10% in places), *S. tenellum* (H; <4%), *S. cuspidatum* (Hl; <4%), *Hypnum jutlandicum* (4-10%), *Racomitrium lanuginosum* (<4%), *Campylopus atrovirens* (<4%), *Pleurozia purpurea* (<4%), *Cladonia portentosa* (4-10%), *C. uncialis* (<4%).
- **Additional comments:** There is a variant of this complex where *Eriophorum angustifolium* is more frequent than *E. vaginatum*; the complex is termed 9a/7/6. This variant is located to the SW of **Sc16** on lobe 2.

COMPLEX 9/7/3 + P

- **Location**: lobe 4& 5 surrounding **Sc1** and **Sc11,** as well as to the south of **Sc1** within lobe 7
- **Ground**: soft
- **Physical indicators**: absent
- ***Calluna* height**: 21-30cm
- ***Cladonia* cover**: 4-10%

- **Macro-topography**: gentle slope
- **Pools**: 4-10%
- ***Sphagnum* cover**: 11-25%
- ***Narthecium* cover**: 4-10% (lower in places)
- **Micro- topography**: Low hummocks/hollows, flats and pools
- **Tussocks**: *Trichophorum germanicum* (<4%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (26-33%), *Eriophorum vaginatum* (4-10%), *E. angustifolium* (4-10%; 11-25% in places), *Narthecium ossifragum* (4-10%), *Carex panicea* (4-10%), *Trichophorum germanicum* (<4%; 4-10 in places), *Drosera anglica* (<4%), *Sphagnum capillifolium* (H; 4-10%), *S. papillosum* (H & Hl; 4-10%; higher in places), *S. tenellum* (H; <4%), *S. cuspidatum* (P; <4%), *Cladonia portentosa* (4-10%)., *Racomitrium lanuginosum* (4-10%; 11-25% in places).
- **Additional comments:** The description above was taken in lobe 4. In this area of lobe 4 this complex grades into complex 9/7 + P in places where there is an increase in pool and *Sphagnum* cover particularly *S. papillosum*, *S. austinii*, *S. cuspidatum* and *S. denticulatum* and a decrease in *Narthecium ossifragum*, *Carex panicea* and *Trichophorum germanicum*.

  Where there are no pools the complex is classed as complex 9/7/3. In these areas there is a higher cover of *Narthecium ossifragum* and *Carex panicea*. The cover of *Cladonia portentosa* is also higher in places (11-25%) and where its cover increases to >50% in the south of lobe 5, the complex is termed complex 9/7/3 + Cl. Where the cover of Myrica gale is >10%, the complex is termed 9/7/3 + My.

COMPLEX 9/7/2 + P

- **Location**: northwest of lobe 4 and to the north of **C2** in lobe 5
- **Ground**: soft
- **Physical indicators**: absent
- ***Calluna* height**: 21-30cm
- ***Cladonia* cover**: 4-10%
- **Macro-topography**: gentle slope (steep in places)
- **Pools**: 4-10%
- ***Sphagnum* cover**: 26-33%
- ***Narthecium* cover**: 4-10%
- **Micro- topography**: Low hummocks/hollows, flats and pools
- **Tussocks**: *Trichophorum germanicum* (4-10%)

- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (26-33%), *Eriophorum vaginatum* (4-10%), *E. angustifolium* (4-10%; 11-25% in places), *Narthecium ossifragum* (4-10%), *Carex panicea* (4-10%), *Trichophorum germanicum* (4-10%), *Drosera anglica* (<4%), *Sphagnum capillifolium* (H; 4-10%), *S. papillosum* (H & Hl; 11-25%), *S. tenellum* (H; <4%), *S. austinii* (H; <4%), *S. cuspidatum* (Hl & P; 4-10%), *Cladonia portentosa* (4-10%).
- **Additional comments:** The description above was taken in lobe 4. This complex is also found in lobe 7 where it approaches sub-central quality in places. The pools here are small but have a good cover of *Sphagnum cuspidatum* with *Rhynchospora alba* at the edges and some *Racomitrium lanuginosum* hummocks. A variety of this complex containing no pools (complex 9/7/2) is also found in lobe 7 and here the *Sphagnum* cover is slightly lower (11-25% with less *S. papillosum* and *S. cuspidatum* in particular) while there is a higher cover of *Trichophorum germanicum* (11-25%) and *Narthecium ossifragum* (11-25%).

COMPLEX 6/3/9 + P

- **Location**: east of lobe 7, between lobe 4&5, south of lobe 2 and southwest of lobe 3
- **Ground**: soft
- **Physical indicators**: absent
- ***Calluna* height**: 11-20cm
- ***Cladonia* cover**: <4%
- **Macro-topography**: gentle slope
- **Pools**: 4-10 (11-25% in places)
- ***Sphagnum* cover**: 11-25%
- ***Narthecium* cover**: 4-10% (higher in places)
- **Micro- topography**: Low hummocks/hollows, flats and pools
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (26-33%), *Erica tetralix* (<4%), *Eriophorum vaginatum* (4-10%), *E. angustifolium* (4-10%), *Narthecium ossifragum* (4-10%; higher in places), *Carex panicea* (4-10%; higher in places), *Trichophorum germanicum* (<4%), *Rhynchospora alba* (<4%; 4-10% in places), *Andromeda polifolia* (<4%), *Sphagnum capillifolium* (H; 4-10%), *S. papillosum* (H & Hl; 11-25%), *S. tenellum* (H; <4%), *S. magellanicum* (Hl & P; <4%), *S. cuspidatum* (Hl & P; <4%), *Cladonia portentosa* (<4%).

- **Additional comments:** The description above was taken in lobe 2. The *Sphagnum* cover in the pools within this complex is poor and where it increases the complex grades into the sub-central complex 6/4 + P. The cover of *Carex panicea* also decreases as the complex grades into sub-central ecotope.

COMPLEX 9/6/3 + P

- **Location**: widespread across lobe 6 and east of lobe 7
- **Ground**: firm to soft
- **Physical indicators**: *Cladonia floerkeana* occasional (<4%)
- ***Calluna* height**: 11-20cm
- ***Cladonia* cover**: <4%
- **Macro-topography**: gentle slope
- **Pools**: 4-10 (11-25% in places)
- ***Sphagnum* cover**: 11-25%
- ***Narthecium* cover**: 4-10% (higher in places)
- **Micro- topography**: Low hummocks/hollows, flats and pools
- **Tussocks**: *Trichophorum germanicum* (4-10%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (11-25%), *Erica tetralix* (<4%), *Eriophorum vaginatum* (4-10%; 11-25% in places), *E. angustifolium* (4-10%; <4% in places), *Narthecium ossifragum* (4-10%; higher in places), *Carex panicea* (4-10%), *Trichophorum germanicum* (4-10%), *Rhynchospora alba* (4-10%), *Campylopus atrovirens* (<4%), *Menyanthes trifoliata* (<4%), *Drosera anglica* (<4%), *Sphagnum capillifolium* (H; 4-10%), *S. papillosum* (H & Hl; 4-10%), *S. tenellum* (H; <4%), *S. denticulatum* (P; <4%), *S. cuspidatum* (Hl & P; 4-10%), *Cladonia portentosa* (<4%).
- **Additional comments:** This complex grades into the sub-central complex 9/7/4 + P where the *Sphagnum* cover increases and the cover of *Carex panicea* and *Trichophorum germanicum* decreases.

COMPLEX 9A/6/3

- **Location**: northwest of lobe 6, west of lobe 7 and northwest of lobe 8
- **Ground**: soft to very soft
- **Physical indicators**: bare peat (4-10%)
- ***Calluna* height**: 11-20cm
- ***Cladonia* cover**: <4%

- **Macro-topography**: flat/gentle slope
- **Pools**: absent
- ***Sphagnum* cover**: 11-25%
- ***Narthecium* cover**: 4-10% (higher in places)
- **Micro- topography**: Low hummocks/hollows and flats
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (4-10%), *Eriophorum vaginatum* (4-10%), *E. angustifolium* (4-10%; 11-25% in places), *Narthecium ossifragum* (4-10%; higher in places), *Carex panicea* (4-10%; higher in places), *Trichophorum germanicum* (<4%), *Erica tetralix* (<4%), *Vaccinium oxycoccos* (<4%), *Sphagnum capillifolium* (H; 4-10%), *S. papillosum* (H & Hl; 4-10%; 11-25% in places), *S. tenellum* (H; <4%), *S. austinii* (H; <4%), *S. cuspidatum* (Hl; <4%), *Hypnum jutlandicum* (4-10%), *Cladonia portentosa* (<4%).
- **Additional comments:** The description above was taken in lobe 8. This complex is also found in lobe 6, where it was recorded in an area that was mapped as sub-central (**Sc5**) complex 9a/7/10 + P in 2004. The area mapped as **Sc5** is now much reduced and is classed as 6/4 + P.

COMPLEX 7/9

- **Location**: southwest of lobe 2, near bog margin
- **Ground**: firm to soft
- **Physical indicators**: no burn damage
- ***Calluna* height**: 41-60cm
- ***Cladonia* cover**: 26-33%
- **Macro-topography**: flat
- **Pools**: absent
- ***Sphagnum* cover**: 11-25%
- ***Narthecium* cover**: <4%
- **Micro-topography:** low *Sphagnum* hummocks
- **Tussocks:** none
- **Degradation or regeneration evidence**: no
- **Species cover**: *Calluna vulgaris* (34-50%), *Erica tetralix* (<4%), *Eriophorum vaginatum* (34-50%), *E. angustifolium* (5%), *Sphagnum capillifolium* (5-10%), *S. papillosum* (1-4%), *Cladonia portentosa* (26-33%).

- **Additional comments**: *Myrica gale* was present in one isolated area. This is typically a relatively poor sub-marginal complex, and was often borderline sub-marginal/marginal at the site. However, the generally low cover of *Narthecium ossifragum* and *Carex panicea*, and the presence of *Eriophorum vaginatum* as a characteristic species, define it as a sub-marginal complex. In part of lobe 2, this complex has a higher cover of *Cladonia portentosa* and where its cover was higher than 50%, the complex was termed 7/9 + Cl.

COMPLEX 6/3/9

- **Location**: widespread across lobe 1, southwest of lobe 3, middle sections of lobe 2&6, east of section between lobes 5&6
- **Ground**: soft
- **Physical indicators**: absent
- ***Calluna* height**: 11-20cm
- ***Cladonia* cover**: <4%
- **Macro-topography**: flat/gentle slope
- **Pools**: absent (<4% in places)
- ***Sphagnum* cover**: 11-25%
- ***Narthecium* cover**: 4-10% (higher in places)
- **Micro- topography**: Low hummocks/hollows and flats
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (11-25%), *Eriophorum vaginatum* (4-10%), *E. angustifolium* (4-10%), *Narthecium ossifragum* (4-10%; higher in places), *Carex panicea* (11-25%), *Trichophorum germanicum* (4-10%), *Rhynchospora alba* (<4%), *Sphagnum capillifolium* (H; 4-10%), *S. papillosum* (H & Hl; 4-10%), *S. tenellum* (H; <4%), *S. cuspidatum* (Hl; <4%), *Cladonia portentosa* (<4%).
- **Additional comments:** The description above was taken in lobe 5. The complex is also present in lobe 7 where it occurs on gentle to steep sloping ground sloping down from **Sc1** to flush F. This area has a higher cover of *Rhynchospora alba* (4-10%; higher in places) and is very wet due to water run-off with the surface being quite slippery.

Marginal Ecotope Complexes

COMPLEX 3/6/7

- **Location**: lobes 3,4,5,7,8&10

- **Ground:** Firm to soft
- **Physical indicators**: absent
- ***Calluna* height**: 21-30cm
- ***Cladonia* cover**: 4-10%
- **Macro-topography**: steep slope (sometimes gentle slope)
- **Pools**: absent
- ***Sphagnum* cover**: 4-10%
- ***Narthecium* cover**: 11-25%
- **Micro- topography**: Hummocks/hollows and flats
- **Tussocks**: *Trichophorum germanicum* (<4%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (11-25%), *Eriophorum vaginatum* (<4%), *E. angustifolium* (<4%; 4-10% in places), *Narthecium ossifragum* (11-25%), *Carex panicea* (4-10%; 11-25% in places), *Trichophorum germanicum* (<4%; 4-10% in places), *Sphagnum capillifolium* (H; <4%; 4-10% in places), *S. papillosum* (H & Hl; <4%), *S. tenellum* (H; <4%), *S. cuspidatum* (Hl; <4%), *Hypnum jutlandicum* (4-10%), *Cladonia portentosa* (4-10%), *C. uncialis* (<4%).
- **Additional comments:** The description above was taken in lobe 10. This complex is also present in lobe 9 (outside of the SAC boundary) where there are numerous standing dead trees up to 4m in height. The complex appears to be slightly flushed here with scattered *Molinia caerulea* and abundant *Polytrichum strictum*.

  This complex is also recorded in lobe 3 where there is a high cover of *Cladonia portentosa* (34-50%) and a higher cover of *Calluna vulgaris* (34-50%) and *Sphagnum capillifolium* (H; 4-10%) so that some areas are considered borderline marginal/sub-marginal. *Huperzia selago* was also recorded here. In the west of lobe 3 there is a very small area (within drainage complex b3H6) where there are scattered *Pinus contorta* trees up to 5-6m tall (but mostly 2-3m) within this complex. In this area the complex is termed 3/6/7 + Pine.

COMPLEX 3/6/2

- **Location**: **Ground:** lobes 1,2,3,4,5,6& 7
- **Physical indicators**: absent
- ***Calluna* height**: 11-20cm
- ***Cladonia* cover**: <4%
- **Macro-topography**: gentle slope
- **Pools**: absent

- ***Sphagnum* cover**: 4-10%
- ***Narthecium* cover**: 11-25%
- **Micro- topography**: Hummocks/hollows and flats
- **Tussocks**: *Trichophorum germanicum* (4-10%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (26-33%; 11-25% in places), *Eriophorum vaginatum* (<4%), *E. angustifolium* (<4%), *Narthecium ossifragum* (11-25%), *Carex panicea* (4-10%; 11-25% in places), *Trichophorum germanicum* (4-10%), *Sphagnum capillifolium* (H; 4-10%), *S. papillosum* (H & Hl; <4%), *S. tenellum* (H; <4%), *S. cuspidatum* (Hl; <4%), *Hypnum jutlandicum* (4-10%), *Cladonia portentosa* (<4%).
- **Additional comments:** The description above was taken in lobe 7. This complex is also found in parts of lobe 2, particularly on the steep slopes to the south of flush X3, where there is a high cover of *Trichophorum germanicum*. *Rhynchospora alba* (4-10%) is more frequent in some of these areas where there are cracks and erosion channels on the bog surface.

COMPLEX 3/6

- **Location**: lobe 1,2,3,6&7
- **Ground:** Firm
- **Physical indicators**: Bare peat (4-10%); *Campylopus introflexus* and *Cladonia floerkeana* (<4%, but frequent)
- ***Calluna* height**: 11-20cm
- ***Cladonia* cover**: <4%
- **Macro-topography**: gentle slope (sometimes steep slope)
- **Pools**: absent (but 4-10% close to the sub-marginal boundary near drains b4E)
- ***Sphagnum* cover**: 4-10%
- ***Narthecium* cover**: 11-25%
- **Micro- topography**: Hummocks/hollows and flats
- **Tussocks**: *Trichophorum germanicum* (<4%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (11-25%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (<4%), *E. angustifolium* (<4%), *Narthecium ossifragum* (11-25%), *Carex panicea* (11-25%), *Rhynchospora alba* (<4%; 4-10% in places), *Trichophorum germanicum* (<4%), *Sphagnum capillifolium* (H; <4%; 4-10% in places), *S. papillosum* (H & Hl; <4%), *S. tenellum* (H; <4%), *S. cuspidatum* (Hl; <4%), *Hypnum jutlandicum* (4-10%), *Cladonia portentosa* (<4%).

- **Additional comments:** The description above was taken in lobe 2. *Rhynchospora alba* (4-10%) is more frequent in places where the bog surface has cracks and erosion channels, particularly in the extreme south-east of Lobe 2. There is also an 8-10m wide firebreak between this complex and the conifer plantation at the edge of the high bog in the south of this lobe. The firebreak is not deep, but mostly bare peat with the vegetation skimmed off the surface. The excavated material is heaped up in front of the trees, which may help limit the drying effects of the firebreak to a small degree. There are also a small number of re-generating *Pinus contorta* within complex 3/6 (and 7/9) here, but these have not spread very far into the high bog and the tallest is ca. 2m.

  The complex is also recorded in lobe 6 where it grades into the slightly wetter marginal complex 3/6/4. This complex is found where the cover of *Rhynchospora alba* is 11-25% and pool cover is 4-10%, but the *Sphagnum* cover within these pools is poor.

COMPLEX 7/2

- **Location**: in isolated areas in lobe 2, 6&8
- **Ground**: firm
- **Physical indicators**: bare peat 5% (colonized by *Campylopus introflexus* and *Cladonia floerkeana* to some extent)
- ***Calluna* height**: 41-60cm
- ***Cladonia* cover**: 4-10%
- **Macro-topography**: ridge at the base of a slope (slopes upwards to north)
- **Pools**: absent
- ***Sphagnum* cover**: <4%
- ***Narthecium* cover**: none
- **Micro-topography:** low *Sphagnum* hummocks, *Trichophorum* tussocks
- **Tussocks:** *Trichophorum germanicum* 10%
- **Degradation or regeneration evidence**: no
- **Species cover**: *Calluna vulgaris* (51-75%), *Eriophorum vaginatum* (5-10%), *Trichophorum germanicum* (10%), *Hypnum jutlandicum* (5-10%), *Cladonia portentosa* (5-10%), *Sphagnum capillifolium* (5-10%).
- **Additional comments**: none

Inactive flushes

FLUSH B

- **Location**: lobe 10
- **Ground**: soft
- **Physical indicators**: absent
- ***Calluna* height**: 41-60cm
- ***Cladonia* cover**: 4-10%
- **Macro-topography**: plateau/gentle slope
- **Pools**: absent
- ***Sphagnum* cover:** 26-33%
- ***Narthecium* cover**: <4%
- **Micro- topography**: Hummocks/hollows
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (51-75%), *Phragmites australis* (<4%), *Molinia caerulea* (<4%), *Eriophorum angustifolium* (<4%), *E. vaginatum* (4-10%), *Vaccinium oxycoccos* (<4%), *Aulacomnium palustre* (<4%; 4-10% in places), *Carex panicea* (<4%), *Polytrichum strictum* (<4%), *Dicranum scoparium* (<4%), *Sphagnum capillifolium* (H; 26-33%), *S. papillosum* (H & Hl; <4%), *S. tenellum* (H; <4%), *S. fallax* (H & Hl; <4%), *S. cuspidatum* (P; 11-25).
- **Additional comments:** This dry flush occurs on a mound/plateau characterized by scattered *Phragmites australis*. There is a relatively good *Sphagnum* cover, but it is mostly of hummocks of *S. capillifolium*.

FLUSH C

- **Location**: lobe 4
- **Ground**: soft
- **Physical indicators**: absent
- ***Calluna* height**: 31-40cm
- ***Cladonia* cover**: <4%
- **Macro-topography**: gentle slope
- **Pools**: one 3m x 3m pool present, otherwise absent
- ***Sphagnum* cover:** 4-10%
- ***Narthecium* cover**: <4%
- **Micro- topography**: n/a
- **Tussocks**: absent

- **Degradation or regeneration evidence**: absent
- **Species cover**: *Molinia caerulea* (76-90%), *Calluna vulgaris* (11-25%), *Eriophorum angustifolium* (<4%), *E. vaginatum* (<4%), *Erica tetralix* (<4%), *Polygala serpyllifolia* (<4%), *Sphagnum capillifolium* (H; 4-10%), *S. papillosum* (H & P; <4%), *S. cuspidatum* (P; <4%).
- **Additional comments:** One small (3m x 3m) pool is found within this small inactive flush. This pool has close to 100% cover of *Sphagnum* mostly of *S. cuspidatum* (51-75%) and *S. papillosum* (11-25%) with *Drosera anglica* also present as well as *Rhynchospora alba* and *Eriophorum angustifolium*.

FLUSH D

- **Location**: lobe 5
- **Ground**: firm to soft
- **Physical indicators**: absent
- ***Calluna* height**: 31-40cm
- ***Cladonia* cover**: 4-10%
- **Macro-topography**: steep slope
- **Pools**: absent
- ***Sphagnum* cover:** 4-10%
- ***Narthecium* cover**: 4-10%
- **Micro- topography**: n/a
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Molinia caerulea* (11-25%), *Calluna vulgaris* (26-33%), *Eriophorum angustifolium* (<4%), *E. vaginatum* (<4%), *Carex panicea* (4-10%), *Sphagnum capillifolium* (H; 4-10%), *S. papillosum* (H & Hl; <4%), *S. cuspidatum* (Hl; <4%).
- **Additional comments:** This small inactive flush is found close to the northern margin of lobe 5. At its northern extent, there is a 4m *Betula pubescens* that may in fact be growing on old cutover. Also recorded in this area were *Rubus fruticosus*, *Juncus effusus*, *Blechnum spicant*, *Hylocomium splendens*, *Polytrichum commune* and *Galium* sp. There are also 5-10 smaller *Betula pubescens* of ca 1.5m in height.

FLUSH E

- **Location**: lobe 2, at the high bog margin
- **Ground**: firm to soft

- **Physical indicators**: absent
- ***Calluna* height**: 41-60cm
- ***Cladonia* cover**: 4-10%
- **Macro-topography**: flat
- **Pools**: absent
- ***Sphagnum* cover**: 11-25%
- ***Narthecium* cover**: <4%
- **Micro-topography:** low hummocks
- **Tussocks:** none
- **Degradation or regeneration evidence**: no
- **Species cover**: *Molinia caerulea* (34-50%), *Calluna vulgaris* (26-33%), *Eriophorum vaginatum* (4-10%), *S. capillifolium* (11-25%).
- **Additional comments**: this small flush is at the high bog margin of lobe 2 in the southern part of the site. The area was not previously mapped within the high bog boundary, presumably as it was considered as old cutover. It is included in the high bog here, however, as no obvious high bog/cutover boundary was observed.

FLUSH F

- **Location**: lobe 7
- **Ground**: firm to soft
- **Physical indicators**: *Campylopus introflexus* (<4%) on burnt hummocks
- ***Calluna* height**: 41-50cm
- ***Cladonia* cover**: <4%
- **Macro-topography**: flat/gentle slope
- **Pools**: absent
- ***Sphagnum* cover:** 11-25%
- ***Narthecium* cover**: <4%
- **Micro- topography**: Hummocks/hollows
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (51-75%), *Myrica gale* (4-10%), *Molinia caerulea* (<4%), *Eriophorum angustifolium* (<4%), *E. vaginatum* (4-10%), *Carex panicea* (<4%), *Vaccinium oxycoccos* (<4%), *Aulacomnium palustre* (<4%), *Dicranum scoparium* (<4%), *Polytrichum strictum* (<4%), *Sphagnum*

capillifolium (H; 11-25%; 4-10% in places), *S. palustre* (H; <4%), *S. papillosum* (H & Hl; <4%), *S. cuspidatum* (Hl; <4%).

- **Additional comments:** This is a long linear flush orientated in a NW/SE direction that may indicate water flow path. It may also connect the active flush, **Y2**, to its north-west with the area of sub-central ecotope (**Sc17**) to its south-east.

FLUSH R1

- This flush is found in the north-east corner of lobe 3 and was not described in the 2013 survey. The 2004 surveyed described is as follows; "*Molinia caerulea* dominated flush with a swallow-hole containing *Molinia caerulea* with flushed *Calluna vulgaris* around the edges. The swallow hole contains *Dryopteris dilatata* and *Succisa pratensis*. This area is inactive. A *Molinia caerulea* dominated area occurs to the north of this area."

FLUSH R2

- **Location**: northeast side of lobe 3
- **Ground**: firm
- **Physical indicators**: none
- ***Calluna* height**: 41-60cm
- ***Cladonia* cover**: <4%
- **Macro-topography**: low ridge in a generally flat area
- **Pools**: none
- ***Sphagnum* cover**: 34-50%
- ***Narthecium* cover**: 1-4%
- **Micro-topography:** tall *Calluna* hummocks, low *Sphagnum* hummocks
- **Tussocks:** none
- **Degradation or regeneration evidence**: none
- **Species cover**: *Calluna vulgaris* (51-75%), *Eriophorum vaginatum* (26-33%), *Aulacomnium palustre* (1-4%), *Hypnum jutlandicum* (1-4%), *Vaccinium oxycoccos* (1-4%) and *Sphagnum capillifolium* (34-50%).
- **Additional comments**: this flush was formerly mapped as a small, approximately circular area, apparently on the basis of a single mapping point taken in the western side of the flush. It is more accurately mapped here as a somewhat larger, more elongated band, approximately 5m wide along its full extent. *Sphagnum* cover was quite high in places and these better quality parts could be considered as borderline active flush.

FLUSH R3

- **Location**: lobe 3
- **Ground**: soft
- **Physical indicators**: absent
- ***Calluna* height**: 31-40cm
- ***Cladonia* cover**: 4-10%
- **Macro-topography**: ridge/gentle slope
- **Pools**: absent
- ***Sphagnum* cover:** 34-50%
- ***Narthecium* cover**: <4%
- **Micro- topography**: Hummocks/hollows
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (34-50%), *Molinia caerulea* (4-10%), *Eriophorum angustifolium* (<4%), *E. vaginatum* (4-10%; 11-25% in places), *Carex panicea* (<4%), *Vaccinium oxycoccos* (<4%), *Aulacomnium palustre* (<4%), *Dicranum scoparium* (<4%), *Sphagnum capillifolium* (H; 34-50%), *S. tenellum* (H; <4%), *S. papillosum* (H & Hl; <4%), *S. cuspidatum* (Hl; <4%).
- **Additional comments:** This is a borderline active/inactive flush that has a high *Sphagnum* cover, but has been classed as inactive because of the fact that it is almost exclusively dominated by hummocks of *S. capillifolium*. It grades into the surrounding sub-marginal complexes 9/7 and 9/7 + Ph, and the difference between these complexes and the flush is subtle.

FLUSH S

There is no flush S described on Bellanagare Bog.

FLUSH T

There is no flush T described on Bellanagare Bog.

FLUSH T2

This flush is found along the northern high bog edge between lobe 5 and 6. It was not described in the 2013 survey. The 2004 survey described is as follows; "The vegetation is dominated by *Molinia caerulea* (50%) with *Carex panicea* (up to 20% in places), *Calluna vulgaris* (20%) (0.3-0.4 m high), *Erica tetralix* (10%), *Cladonia* (< 5%) and occasional *Myrica gale*. The *Sphagnum* cover is 20% and is

dominated by hummocks of *S. capillifolium*. Occasional hummocks of *S. austinii* are present. *Salix cinerea* occurs along drain bC24, which cuts through the drain. The southeastern section grades into flushed sub-central **Sc5** (E 171501 / N286742). The vegetation in this area is dominated by *Eriophorum angustifolium* and flushed *Calluna vulgaris*. The general *Sphagnum* cover is 50% and is dominated by low flat lawn patches of *S. capillifolium*, *S. papillosum* and occasional *S. austinii*.

FLUSH U

There is no flush U described on Bellanagare Bog.

FLUSH U2

- **Location**: lobe 6 & 7
- **Ground**: firm to soft
- **Physical indicators**: absent
- ***Calluna* height**: 31-40cm
- ***Cladonia* cover**: 4-10% (<4% in places)
- **Macro-topography**: gentle slope (steep in places)
- **Pools**: absent
- ***Sphagnum* cover:** 11-25% (4-10% in places)
- ***Narthecium* cover**: 4-10% (11-25% in places)
- **Micro- topography**: Hummocks/hollows
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Molinia caerulea* (4-10%; scattered throughout; much higher in places), *Myrica gale* (4-10%; scattered throughout), *Calluna vulgaris* (34-50%), *Eriophorum angustifolium* (<4%), *E. vaginatum* (4-10%), *Erica tetralix* (<4%), *Narthecium ossifragum* (4-10%), *Carex panicea* (11-25%), *Trichophorum germanicum,* (4-10%), *Hypnum jutlandicum* (4-10%), *Sphagnum capillifolium* (H; 4-10%), *S. papillosum* (H & Hl; 4-10%), *S. tenellum* (H; <4%), *S. cuspidatum* (Hl; <4).
- **Additional comments:** *Molinia caerulea* dominates in small areas within this flush occurring at 51-75% cover. These areas tend to be firmer underfoot and have a lower *Sphagnum* cover (4-10%).

FLUSH V

There is no flush V described on Bellanagare Bog.

FLUSH V2

- **Location**: Southeastern corner of lobe 7
- **Ground**: firm
- **Physical indicators**: none
- ***Calluna* height**: >60cm
- ***Cladonia* cover**: none
- **Macro-topography**: gentle slope to south
- **Pools**: none
- ***Sphagnum* cover**: 4-10%
- ***Narthecium* cover**: none
- **Micro-topography:** high hummocks of tall *Calluna vulgaris*
- **Tussocks:** none
- **Degradation or regeneration evidence**: no
- **Species cover**: *Molinia caerulea* (50%), *Calluna vulgaris* (34-50%), *Juncus effusus* (4-10%), *Pteridium aquilinum* (<4%), *Luzula sylvatica* (<4%), *Salix* sp. (<4%), *Sphagnum capillifolium* (4-10%).
- **Additional comments**: the current description of this small, inactive flush differs markedly from that of Fernandez *et al*. (2005), in that the cover values of *Pteridium aquilinum* and *Molinia caerulea* were recorded then as 30% and 10%, respectively, while *Calluna vulgaris* height was recorded as 0.3-0.4m.

FLUSH W

There is no flush W described on Bellanagare Bog.

FLUSH W2

See description under Active Raised Bog.

FLUSH W3/W5

- **Location**: Southern margin of lobe 3
- **Ground**: firm
- **Physical indicators**: none
- ***Calluna* height**: 41-60cm
- ***Cladonia* cover**: <4%
- **Macro-topography**: depression

- **Pools**: none
- ***Sphagnum* cover**: 4-10%
- ***Narthecium* cover**: none
- **Micro-topography:** hummocks of tall *Calluna vulgaris*
- **Tussocks:** none
- **Degradation or regeneration evidence**: no
- **Species cover**: *Molinia caerulea* (51-75%), *Calluna vulgaris* (11-25%), *Eriophorum vaginatum* (<4%), *Erica tetralix* (<4%), *Carex panicea* (<4%), *Sphagnum capillifolium* (5-10%).
- **Additional comments**: This flush supports a number of diverse habitat including a spring or pool, substantial areas of wet scrub and Birch woodland as well as some more typical *Molinia caerulea*-dominated bog habitat (**W3**). The open water pool (described as a spring in Kelly *et al*, 1995) is dominated by *Equisetum* spp. and *Potamogeton* sp. A small wet willow/birch scrub is found to the south of the pool, then a more extensive Birch wood further south again (**W5**). Wet willow/birch scrub has *Succisa pratensis*, *Equisetum* spp., *Molinia caerulea* and *Cirsium palustre*. The drier Birch wood has zero *Sphagnum*, abundant *Rhytidiadelphus triquetrus*, *Thuidium tamariscinum* and *Rubus fruticosus*. A small stream/channel flows through the wood (river marked on 6' map). The northern tip of **W3** also has a scrub area of *Salix* sp. This flush is associated with a small bog burst according to Kelly *et al.* (1995).

FLUSH W4

- **Location**: lobe 3
- **Ground**: soft
- **Physical indicators**: absent
- ***Calluna* height**: 41-50cm
- ***Cladonia* cover**: 26-33%
- **Macro-topography**: gentle slope
- **Pools**: absent
- ***Sphagnum* cover:** 11-25%
- ***Narthecium* cover**: absent
- **Micro- topography**: Hummocks/hollows
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Salix sp.* (4-10%), *Myrica gale* (4-10%), *Calluna vulgaris* (34-50%), *Erica tetralix* (<4%), *Eriophorum angustifolium* (<4%), *E. vaginatum* (<4%), *Rubus fruticosus* (<4%), *Carex panicea*

(<4%), *Andromeda polifolia* (<4%), *Vaccinium oxycoccos* (<4%), *Juncus effusus* (<4%), *Polytrichum commune* (<4%), *P. strictum* (<4%), *Hylocomium splendens* (<4%), *Hypnum jutlandicum* (4-10%), *Sphagnum capillifolium* (H; 11-25%), *S. papillosum* (H & Hl; <4%), *S. palustre* (H; <4%), *S. cuspidatum* (Hl; <4).

- **Additional comments:** An additional *Sphagnum* species was recorded within this flush, but no sample was taken. It was recorded as being either *S. teres* or *S. squarrosum*.

FLUSH X

- **Location**: lobe 9
- **Ground**: soft
- **Physical indicators**: absent
- ***Calluna* height**: 41-60cm
- ***Cladonia* cover**: 4-10%
- **Macro-topography**: gentle slope
- **Pools**: absent
- ***Sphagnum* cover:** 11-25% (higher in places)
- ***Narthecium* cover**: 4-10%
- **Micro- topography**: Hummocks/hollows
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Molinia caerulea* (34-50%), *Calluna vulgaris* (11-25%), *Eriophorum angustifolium* (4-10%), *E. vaginatum* (4-10%), *Erica tetralix* (<4%), *Narthecium ossifragum* (4-10%), *Carex panicea* (4-10%), *Trichophorum germanicum,* (<4%), *Empetrum nigrum* (<4%), *Vaccinium oxycoccos* (<4%), *Potentilla erecta* (<4%), *Pedicularis sylvatica* (<4%), *Aulacomnium palustre* (<4%), *Polytrichum strictum* (<4%), *Pleurozium schreberi* (<4%), *Hypnum jutlandicum* (4-10%), *Sphagnum capillifolium* (H; 4-10%), *S. papillosum* (H & Hl; 4-10%; higher in places), *S. tenellum* (H; <4%), *S. austinii* (H; <4%), *S. palustre* (H; <4%), *S. cuspidatum* (Hl; <4).
- **Additional comments:** This flush is very variable, but is mostly inactive although there are small areas, which could be considered as active raised bog. Most of the flush is dominated by *Molinia caerulea* (34-50% cover and higher) and *Calluna vulgaris* (26-33%) and these areas generally have a *Sphagnum* cover of 11-25% composed mostly of hummocks of *S. capillifolium*. However, there are some more open areas where the cover of *Molinia caerulea* is lower (4-10%) and these areas sometimes have a higher *Sphagnum* cover (34-50%). The species covers are very variable and the list above is considered an average.

This flush is essentially an extension of flush **Y** to its south as they join at the E/W drain of Drain Complex bC.

FLUSH X2

See description under Active Raised Bog.

FLUSH X3

- **Location**: lobes 1 and 2
- **Ground**: firm to soft
- **Physical indicators**: none
- ***Calluna* height**: >60cm
- ***Cladonia* cover**: <4%
- **Macro-topography**: partly in a depression along a drainage channel; flat in some parts
- **Pools**: none
- ***Sphagnum* cover**: 4-10%
- ***Narthecium* cover**: none
- **Micro-topography:** low hummocks
- **Tussocks:** none
- **Degradation or regeneration evidence**: no
- **Species cover**: *Molinia caerulea* (76-90%), *Calluna vulgaris* (11-25%), *Sphagnum capillifolium* (4-10%).
- **Additional comments**: A number of swallow holes, some of which had a strong water flow, were noted in this flush. This is a largely inactive flush, but there is a small (10m x 7m) *Sphagnum*-filled pool present that is considered as Active Raised Bog. *S. cuspidatum* and *S. papillosum* dominate with *S. fallax* present in the south-western end of the pool. *Eriophorum angustifolium* (4-10%) grows in the pool along with *Molinia caerulea*, *Vaccinium oxycoccos*, *Andromeda polifolia*, *Empetrum nigrum* and *Aulacomnium palustre*. The pool is surrounded by vegetation dominated by *Calluna vulgaris* and *Molinia caerulea*.

  Much of **X3** is centred around a deep drainage channel and in some areas along the boundary of flush/marginal ecotope there is disturbed ground with frequent *Cladonia floerkeana*.

FLUSH X4

- **Location**: lobes 1, Southeast corner
- **Ground**: firm to soft

- **Physical indicators**: none
- ***Calluna* height**: 41-60cm (c. 60cm)
- ***Cladonia* cover**: <1%
- **Macro-topography**: flat
- **Pools**: absent
- ***Sphagnum* cover**: 4-10%
- ***Narthecium* cover**: none
- **Micro-topography:** low hummocks/tall *Calluna vulgaris*
- **Tussocks:** none
- **Degradation or regeneration evidence**: no
- **Species cover**: *Molinia caerulea* (51-75%), *Calluna vulgaris* (34-50%), *Sphagnum capillifolium* (4-10%), *Hypnum jutlandicum* (<4%).
- **Additional comments**: two substantial areas of dense, *Ulex europaeus*-dominated scrub were mapped within this flush. Other species present in the scrub areas included *Salix* sp. (up to 3m tall), *Luzula sylvatica*, *Rubus fruticosus* and *Polytrichum commune*.

FLUSH X5

- **Location**: lobe 1, southeast corner
- **Ground**: firm
- **Physical indicators**: old burnt *Calluna* stems; disturbed soil colonised by *Campylopus introflexus*
- ***Calluna* height**: 41-60cm
- ***Cladonia* cover**: <4%
- **Macro-topography**: gentle slope to south
- **Pools**: none
- ***Sphagnum* cover**: 4-10% (<4% in places)
- ***Narthecium* cover**: none
- **Micro-topography:** low Calluna hummocks
- **Tussocks:** none
- **Degradation or regeneration evidence**: none (previously un-surveyed)
- **Species cover**: *Molinia caerulea* (34-50%), *Calluna vulgaris* (51-75%), *Sphagnum capillifolium* (<4%; higher in places), *Hypnum jutlandicum* (<4%), *Campylopus introflexus* (<4%).
- **Additional comments**: none.

FLUSH Y

- **Location**: lobes 8 and 10
- **Ground**: firm to soft
- **Physical indicators**: dead *Calluna vulgaris* stems from old burn
- ***Calluna* height**: 21-40cm
- ***Cladonia* cover**: <1% (burn damage)
- **Macro-topography**: part depression, and gentle slope to NW
- **Pools**: none
- ***Sphagnum* cover**: 11-25%
- ***Narthecium* cover**: none
- **Micro-topography:** tall *Calluna vulgaris*, low *Sphagnum* hummocks/hollows/*Molinia* tussocks
- **Tussocks:** *Molinia caerulea* 10%; *Eriophorum vaginatum* 10%
- **Degradation or regeneration evidence**: no
- **Species cover**: *Calluna vulgaris* (34-50%; 51-75% in places), *Eriophorum vaginatum* (11-25%), *Molinia caerulea* (11-25%), *Hypnum jutlandicum* (4-10%), *Sphagnum capillifolium* (4-10%), *S. papillosum* (4-10%).
- **Additional comments**: *Vaccinium oxycoccos*, *Empetrum nigrum*, *Aulacomnium palustre* and *Pleurozium schreberi* were also present and an area of approximately 30m x 15m in the south of the flush had a sparse cover of *Phragmites australis*. Some of the ground in this flush was wet, particularly in that part in the east side of the flush formerly mapped as active flush, but it didn't have the typical diverse micro-topography or high *Sphagnum* cover of Active Raised Bog. Four separate areas of flush Y, all in the southern part of the flush, were formerly mapped as active flush (Fernandez *et al*., 2005). However, none of these proved to support Active Raised Bog habitat during the present survey and they are all now integrated into the large inactive flush Y. The polygon that was contiguous to former **Sc13** is essentially complex 9/7 with the addition of *Molinia caerulea*. Of the other active flush polygons mapped in 2004, the largest is *Molinia*-dominated (up to 90%+ in places) with *Myrica gale* and tall *Calluna vulgaris*. Some of this area appears to be old cutover, but not regenerating ARB. *Polytrichum commune*, *P. strictum* and *Juncus effusus* are present and the area is occasionally wet but with no ARB micro-topography and no substantial cover of *Sphagnum*. The smallest of the former active flush polygons is also dominated by tall clumped *Molinia caerulea* (90%+ in places) as well as *Myrica gale* and tall *Calluna vulgaris* with a *Sphagnum* cover of <10%. The most southerly of the former active flush polygons is again dominated by *Molinia caerulea* (>90%cover) as well as *Myrica gale* and *Calluna vulgaris* with some pools present where peat was excavated for dam building.

There are a number of tall *Salix* shrubs (2.5m in height) to the south of flush Y.

FLUSH Y2

See description under Active Raised Bog.

FLUSH Y3

- **Location**: along a drainage complex between lobes 4 and 5
- **Ground**: firm
- **Physical indicators**: none
- ***Calluna* height**: 41-60cm
- ***Cladonia* cover**: 11-25%
- **Macro-topography**: part depression; sloping into swallow hole in NW part
- **Pools**: none
- ***Sphagnum* cover**: 4-10%
- ***Narthecium* cover**: none
- **Micro-topography:** tall *Calluna* and *Cladonia* hummocks, low *Sphagnum* hummocks
- **Tussocks:** none
- **Degradation or regeneration evidence**: no
- **Species cover**: *Molinia caerulea* (76-90%), *Calluna vulgaris* (11-25%), *Cladonia portentosa* (11-25%), *Polygala serpyllifolia* (<1%), *Sphagnum capillifolium* (5%).
- **Additional comments**: Large swallow holes were a feature of this flush; a strong water flow was noted at one of these holes in the northwest of the flush. An active flush point was recorded in the eastern part of **Y3**, but was considered too small to map. There was some very wet ground in one area (re-wetting by drain) but the total *Sphagnum* cover here was not high enough to consider mapping as Active Raised Bog, and it was retained as inactive flush.

FLUSH Y4

See description under Active Raised Bog.

FLUSH Z

- **Location**: lobe 8
- **Ground**: soft
- **Physical indicators**: absent
- ***Calluna* height**: 41-60cm

- ***Cladonia* cover**: <4%
- **Macro-topography**: gentle slope
- **Pools**: largely absent
- ***Sphagnum* cover:** 11-25% (higher in places)
- ***Narthecium* cover**: <4%
- **Micro- topography**: N/A
- **Tussocks**: *Molinia caerulea* in places
- **Degradation or regeneration evidence**: this flush appears to be drying out as indicated by the fact that the open water pool mapped here in 2004 is now largely an area of dry *Molinia caerulea* dominated flush in a basin with some wet channels that contain running water flowing towards the north-west
- **Species cover**: n/a
- **Additional comments:** The species covers are very variable over the extent of the flush but it is largely dominated by *Molinia caerulea* and *Calluna vulgaris*. There are patches within wet channels where the *Sphagnum* cover is high, but generally the *Sphagnum* cover is poor (11-25%). There are also some scattered *Betula pubescens*. The wettest area within this flush was marked by two active flush dots (see community complexes maps) during the 2013 survey and this area was dominated by *Juncus effusus* and *Eriophorum angustifolium* with frequent tussocks of *Molinia caerulea*. The *Sphagnum* layer in this area was dominated by *S. cuspidatum*, *S. papillosum* and *S. palustre*. *Galium* sp., *Juncus bulbosus* and *Polytrichum strictum* are also present.

  A deep drain bB1 (Drain Complex bB) runs right through this flush and one of Drain Complex bA drains (Drain bA7) also runs through part of this flush. Although these drains have been blocked, flowing water was still recorded during the 2013 survey heading NNW.

FLUSH Z2

This flush is found on the northeast of lobe 7 and was not described in the 2013 survey. The 2004 surveyed described is as follows; "There is a gentle slope down northwards towards drain bD. *Molinia caerulea* (>50%) dominates the vegetation, which has been burned within the last year. Burned *Sphagnum* hummocks (mostly *S. capillifolium*) cover approximately 25-30% of the ground layer".

FLUSH Z3

This flush is found in the centre of lobe 4 and was not described in the 2013 survey. The 2004 surveyed described is as follows; "This is a small inactive flush (70 x 50m) with tall *Calluna vulgaris*

(up to 0.4m), *Eriophorum angustifolium*, *E. vaginatum*, *Molinia caerulea* and *Phragmites australis*. *Cladonia portentosa* covers 40% of the flush surface."

FLUSH Z4

- **Location**: lobe 2, near the southern margin of the high bog
- **Ground**: firm to soft
- **Physical indicators**: none
- ***Calluna* height**: >60cm
- ***Cladonia* cover**: <4%
- **Macro-topography**: deep depression; particularly steep slope on northern side
- **Pools**: none
- ***Sphagnum* cover**: 4-10%
- ***Narthecium* cover**: none
- **Micro-topography:** tall *Calluna vulgaris* hummocks, *Molinia caerulea* tussocks
- **Tussocks:** *Molinia caerulea*
- **Degradation or regeneration evidence**: none
- **Species cover**: *Molinia caerulea* (76-90%), *Calluna vulgaris* (11-25%), *Eriophorum vaginatum* (11-25%), *Empetrum nigrum* (<1%), *Juncus effusus* (<1%), *Sphagnum capillifolium* (4-10%).
- **Additional comments**: In the eastern side of the flush, *Molinia caerulea* was much less abundant, and *Eriophorum vaginatum*, which was otherwise uncommon, had a cover value of up to 30%. *Calluna vulgaris* height here was only up to 30-40cm – substantially less than the overall >60cm. *Phragmites australis* was recorded as a common species in this flush in the survey by Fernandez *et al*. (2005), but was not recorded at all in the present survey.

FLUSH Z5

This flush is found in the west of lobe 8 and was not described in the 2004 or 2013 survey. However, it was mapped as an area of *Myrica gale* and *Phragmites* australis by Kelly *et al.* (1995).

Face bank Complexes

COMPLEX 1

- **Location**: this complex was found along the bog margin
- **Ground**: firm
- **Physical indicators**: bare peat (4-10%)

- ***Calluna* height**: >50cm
- ***Cladonia* cover**: <4%
- **Macro-topography**: steep slope
- **Pools**: absent
- ***Sphagnum* cover**: generally absent but <4% in places
- ***Narthecium* cover**: <4%
- **Micro- topography:** tall robust *Calluna vulgaris*/low hummocks
- **Tussocks:** *Trichophorum germanicum* (<4%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (76-90%), *Erica tetralix* (4-10%), *Trichophorum germanicum* (<4%), *Narthecium ossifragum* (<4%), *Sphagnum capillifolium* (H; <4%), *S. tenellum* (H; <4%), *Hypnum jutlandicum* (4-10%).
- **Additional comments**: none

Depressions on peat substrates of the Rhynchosporion (7150)

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

R. alba is found in all ecotopes in Bellanagare, such as: central ecotope (complex 35) sub-central ecotope (4/10; 6/4 + P and 9/7/4 + P); sub-marginal ecotope (9/7/4; 9/7/6; 9/7/2 + P; 6/3/9 +P; 9/6/3 + P and 6/3/9) and marginal ecotope (3/6; 3/6/4; 3/6/2).

The species becomes very frequent within complexes 4/10, 6/4 + P and 9/7/4 + P (sub-central); 9/7/4; 6/3/9 + P; 9/6/3 + P (sub-marginal) and 3/6/4 (marginal, but within run off channels).

The species is always found associated with wet features such as *Sphagnum* pools, *Sphagnum* lawns and hollows, along with *Sphagnum magellanicum*, *S. papillosum*, *S. cuspidatum*. It was also found within *Narthecium ossifragum* dominated hollows in sub-marginal and marginal ecotope complexes. *R. alba* was also recorded in more degraded areas of the bog such as steep slope sections at the edge of the bog where bare peat and erosion channels are found.

Appendix II Photographical records

Photograph Number	Aspect	Type	Feature	Date
DSCF3611	NE	Overview	Qsc1	13/02/2013
DSCF3610	NE	Overview	Qsc2	13/02/2013
DSCF3609	NE	Overview	Qsc3	12/02/2013
DSCF3612	NE	Overview	Qsc4	18/02/2013
19022013254	NE	Overview	Qaf1	19/02/2013

Appendix III Quadrats

Ecotope type	**Sub-central**	**Sub-central**	**Sub-central**	**Sub-central**
Complex Name	**9/10 or 35**	**9/7+P**	**9/7+P**	**9/7+P**
Quadrat Name	Qsc1	Qsc1	Qsc2	Qsc2
Easting	170164.53	170164.78	170207.33	170208.26
Northing	284976.95	284973.18	286381.03	286379.23
Date	22/09/2004	14/02/2013	23/09/2004	13/02/2013
Firmness	quaking	Very soft	very soft	Soft
Burnt	No	No	No	No
Algae in hollows %	1-3 (few indiv)	Absent	Absent	Absent
Algae in pools %	4-10	Absent	4-10	Absent
Bare peat %	Absent	Absent	Absent	Absent
High hummocks %	na	4-10	na	4-10
Low hummocks %	11-25	26-33	11-25	51-75
Hollows %	11-25	4-10	11-25	4-10
Lawns %	4-10	Absent	Absent	Absent
Pools %	4-10	11-25	11-25	11-25
Pool type	Tear &Regular	Regular	Tear	Regular
S.austinii hum type	Absent	Absent	na	Absent
S.austinii hum %	Absent	Absent	1-3 (few indiv)	Absent
S.austinii height(cm)	Absent	Absent	na	Absent
S.fuscum hum type	na	Absent	na	Absent
S.fuscum hum %	na	Absent	na	Absent
S.fuscum height(cm)	na	Absent	na	Absent
Leucobryum glaucum	na	Absent	na	Absent
Trichophorum type	Flats	Flats	na	Flats
Trichophorum %	4-10	1-3 (many indiv)	4-10	1-3 (many indiv)
S.magellanicum %	4-10	4-10	Absent	Absent
S.cuspidatum %	1-3 (few indiv)	4-10	4-10	4-10
S.papillosum %	4-10	1-3 (many indiv)	4-10	4-10
S.denticulatum %	Absent	Absent	Absent	1-3 (many indiv)
S.capillifolium%	4-10	1-3 (many indiv)	11-25	4-10
S.tenellum %	na	1-3 (many indiv)	na	1-3 (many indiv)
S.subnitens %	na	Absent	na	Absent
R.fusca %	na	Absent	na	Absent

Ecotope type	**Sub-central**	**Sub-central**	**Sub-central**	**Sub-central**
Complex Name	**9/10 or 35**	**9/7+P**	**9/7+P**	**9/7+P**
R.alba %	4-10	1-3 (several indiv)	4-10	1-3 (few indiv)
N.ossifragum %	4-10	1-3 (many indiv)	1-3 (few indiv)	Absent
Sphag pools %	4-10	4-10	11-25	11-25
Dominant pool Sphag	S.cuspidatum	S.magellanicum	S.cuspidatum	S.cuspidatum
Sphag lawns %	4-10	Absent	Absent	Absent
Sphag humm %	11-25	4-10	11-25	11-25
Sphag holl %	4-10	4-10	4-10	1-3 (many indiv)
Total Sphag %	26-33	11-25	26-33	26-33
Hummocks indicators		Absent	S.austinii	Absent
Cladonia portent %	4-10	1-3 (many indiv)	4-10	26-33
Other Cladonia sp	na	C.uncialis	na	C.uncialis
C. panicea %	na	Absent	na	1-3 (few indiv)
Calluna cover %	4-10	34-50	11-25	26-33
Calluna height(cm)	11-20	21-30	21-30	21-30
Other NotableSpecies	Racomotrium lanuginosum	D. anglica Raco 20-25% V.oxy Pleurozia purp		Raco 4-10% D. anglica
Other comment		Borderline sc/sm quad. adj sm		

Ecotope type	**Sub-central**	**Sub-central**	**Sub-central**	**Sub-central**
Complex Name	**6/4/2 P (RB)**	**6/4+P**	**9/7/4+P**	**9/7/10**
Quadrat Name	Qsc3	Qsc3	Qsc4	Qaf1
Easting	172398.67	172395.76	171324.78	170904.01
Northing	287478.33	287475.42	286461.53	285270.04
Date	24/09/2004	12/02/2013	18/02/2013	19/02/2013
Firmness	quaking	Soft	Soft	Very soft
Burnt	2004	No	No	No
Algae in hollows %	1-3 (few indiv)	Absent	Absent	Absent
Algae in pools %	Absent	Absent	Absent	Absent
Bare peat %	1-3 (few indiv)	Absent	Absent	Absent
High hummocks %	na	Absent	Absent	Absent
Low hummocks %	4-10	34-50	26-33	34-50
Hollows %	4-10	Absent	11-25	51-75
Lawns %	11-25	4-10	Absent	Absent

Ecotope type	**Sub-central**	**Sub-central**	**Sub-central**	**Sub-central**
Complex Name	**6/4/2 P (RB)**	**6/4+P**	**9/7/4+P**	**9/7/10**
Pools %	26-33	11-25	11-25	Absent
Pool type	Interconnecting	Regular	Absent	Absent
S.austinii hum type	na	Absent	Absent	Absent
S.austinii hum %	4-10	Absent	Absent	Absent
S.austinii height(cm)	na	Absent	Absent	Absent
S.fuscum hum type	na	Absent	Absent	Absent
S.fuscum hum %	na	Absent	Absent	Absent
S.fuscum height(cm)	na	Absent	Absent	Absent
Leucobryum glaucum	na	Absent	Absent	Absent
Trichophorum type	Flats	Flats	Flats	Flats
Trichophorum %	4-10	1-3 (few indiv)	1-3 (few indiv)	1-3 (many indiv)
S.magellanicum %	1-3 (few indiv)	1-3 (many indiv)	Absent	Absent
S.cuspidatum %	na	4-10	11-25	Absent
S.papillosum %	4-10	26-33	11-25	4-10
S.denticulatum %	na	Absent	1-3 (many indiv)	Absent
S.capillifolium%	11-25	1-3 (many indiv)	4-10	51-75
S.tenellum %	na	Absent	1-3 (few indiv)	1-3 (many indiv)
S.subnitens %	na	Absent	Absent	Absent
R.fusca %	na	Absent	Absent	Absent
R.alba %	11-25	4-10	11-25	Absent
N.ossifragum %	26-33	4-10	1-3 (many indiv)	1-3 (several indiv)
Sphag pools %	11-25	4-10	11-25	Absent
Dominant pool Sphag	na	S.cuspidatum	S.cuspidatum	
Sphag lawns %	11-25	4-10	Absent	Absent
Sphag humm %	4-10	11-25	11-25	26-33
Sphag holl %	4-10	Absent	4-10	34-50
Total Sphag %	34-50	34-50	51-75	51-75
Hummocks indicators	S.austinii	Absent	Absent	Absent
Cladonia portent %	Absent	1-3 (few indiv)	1-3 (many indiv)	1-3 (few indiv)
Other Cladonia sp	na	C. uncialis	C.uncialis	C. floerkeana - 1 small clump
C. panicea %	na	Absent	1-3 (few indiv)	1-3 (many indiv)
Calluna cover %	1-3 (few indiv)	26-33	11-25	26-33
Calluna height(cm)	11-20	11-20	11-20	21-30
Other NotableSpecies		Raco	C.atro Raco	Vacc oxy; Poly stric;

Ecotope type	**Sub-central**	**Sub-central**	**Sub-central**	**Sub-central**
Complex Name	**6/4/2 P (RB)**	**6/4+P**	**9/7/4+P**	**9/7/10**
Other comment				Aulo palu; Dicr scop; Andr poli; E. vag 25%

Ecotope type	**Sub-marginal**
Complex Name	**6/3/2+TP**
Quadrat Name	Qsm1
Easting	171653.85
Northing	286265.25
Date	21/09/2004
Firmness	soft
Burnt	No
Algae in hollows %	Absent
Algae in pools %	4-10
Bare peat %	1-3 (few indiv)
High hummocks %	na
Low hummocks %	11-25
Hollows %	4-10
Lawns %	11-25
Pools %	Absent
Pool type	Tear
S.austinii hum type	na
S.austinii hum %	1-3 (few indiv)
S.austinii height(cm)	na
S.fuscum hum type	na
S.fuscum hum %	na
S.fuscum height(cm)	na
Leucobryum glaucum	na
Trichophorum type	Tussocks
Trichophorum %	4-10
S.magellanicum %	4-10
S.cuspidatum %	1-3 (few indiv)
S.papillosum %	4-10
S.denticulatum %	na

Ecotope type	**Sub-marginal**
Complex Name	**6/3/2+TP**
S.capillifolium%	4-10
S.tenellum %	na
S.subnitens %	na
R.fusca %	na
R.alba %	4-10
N.ossifragum %	4-10
Sphag pools %	Absent
Dominant pool Sphag	S.cuspidatum
Sphag lawns %	11-25
Sphag humm %	11-25
Sphag holl %	4-10
Total Sphag %	11-25
Hummocks indicators	S.austinii
Cladonia portent %	1-3 (few indiv)
Other Cladonia sp	na
C. panicea %	na
Calluna cover %	11-25
Calluna height(cm)	21-30
Other NotableSpecies	Racomitrium lanuginosum
Other comment	

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

Appendix IV Survey maps

Raised Bog Monitoring & Assessment Survey 2013

Map 1: Ecotopes Map and Quadrats (1 of 2)

Ecology and Environmental Consultants Ireland Ltd.

Bellanagare SAC (000592)
Co. Roscommon

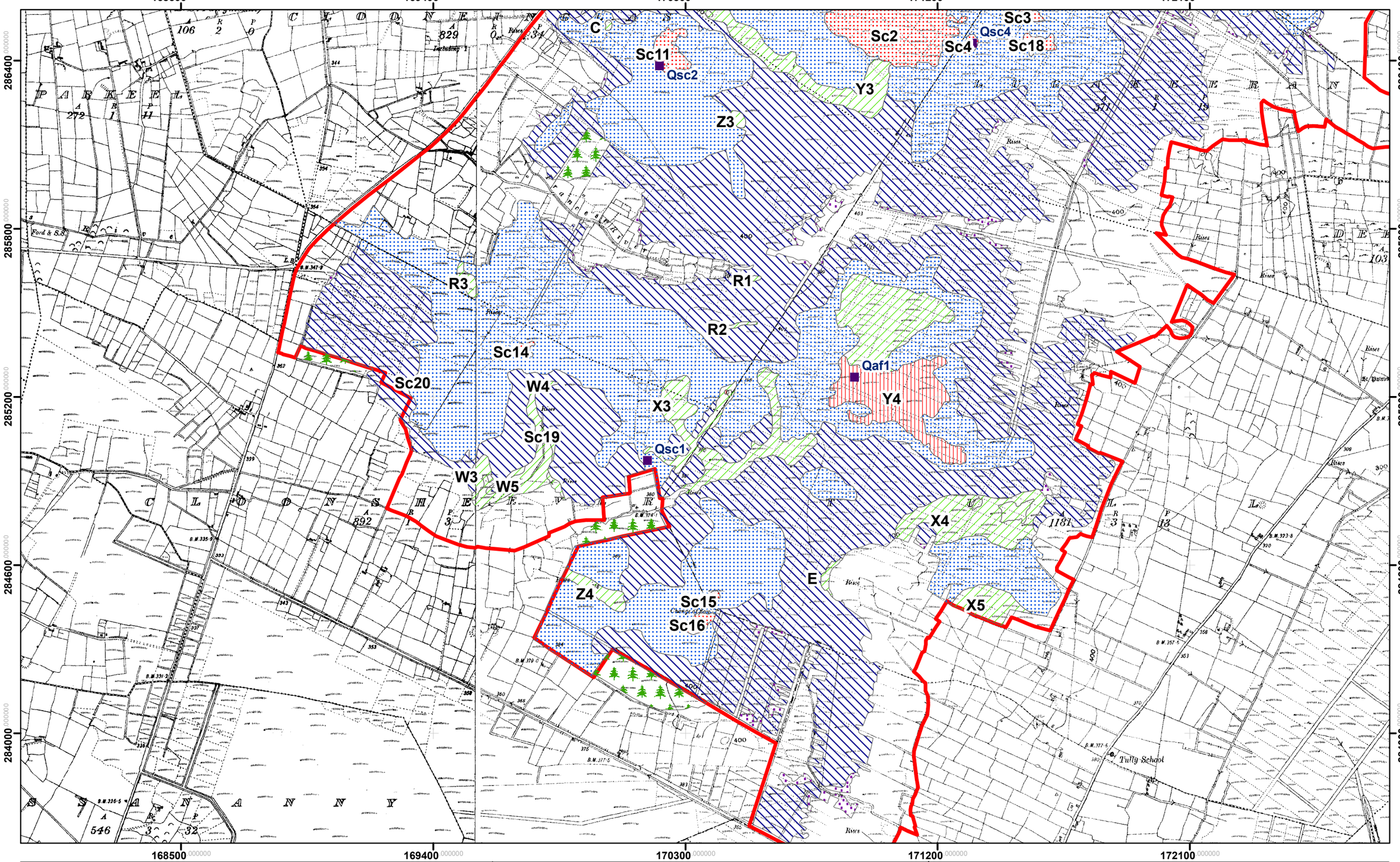
1:13,000

N

0 162.5 325 650 975 1,300 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



Raised Bog Monitoring & Assessment Survey 2013

Map 1: Ecotopes Map and Quadrats (2 of 2)

Ecology and Environmental Consultants Ireland Ltd.

Bellanagare SAC (000592)
Co. Roscommon

1:13,000

N

0 162.5 325 650 975 1,300 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

Raised Bog Monitoring & Assessment Survey 2013

Map 2: Vegetation community complexes (1 of 2)

Ecology and Environmental Consultants Ireland Ltd.

Bellanagare SAC (000592)
Co. Roscommon

1:13,000

N

0 187.5 375 750 1,125 1,500 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
- SC/C
- F/C
- SM/C
- M/C
- F/SC
- SM/SC
- M/SC
- FB/SC
- F/SM
- M/SM
- SM/FB
- F/M
- M/FB
- F/FB
- Other
- SAC

168500 169400 170300 171200 172100

286400 285800 285200 284600 284000

Not available

Raised Bog Monitoring & Assessment Survey 2013

Map 2: Vegetation community complexes (2 of 2)

Ecology and Environmental Consultants Ireland Ltd.

Bellanagare SAC (000592)
Co. Roscommon

1:13,000

N

0 187.5 375 750 1,125 1,500 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
- SC/C
- F/C
- SM/C
- M/C
- F/SC
- SM/SC
- M/SC
- FB/SC
- F/SM
- M/SM
- SM/FB
- F/M
- M/FB
- F/FB
- Other
- SAC

Raised Bog Monitoring & Assessment Survey 2013

Map 3: Impacts (High bog drainage; Turf cutting;Fire events) (1 of 2)

Ecology and Environmental Consultants Ireland Ltd.

Bellanagare SAC (000592)
Co. Roscommon

1:13,000

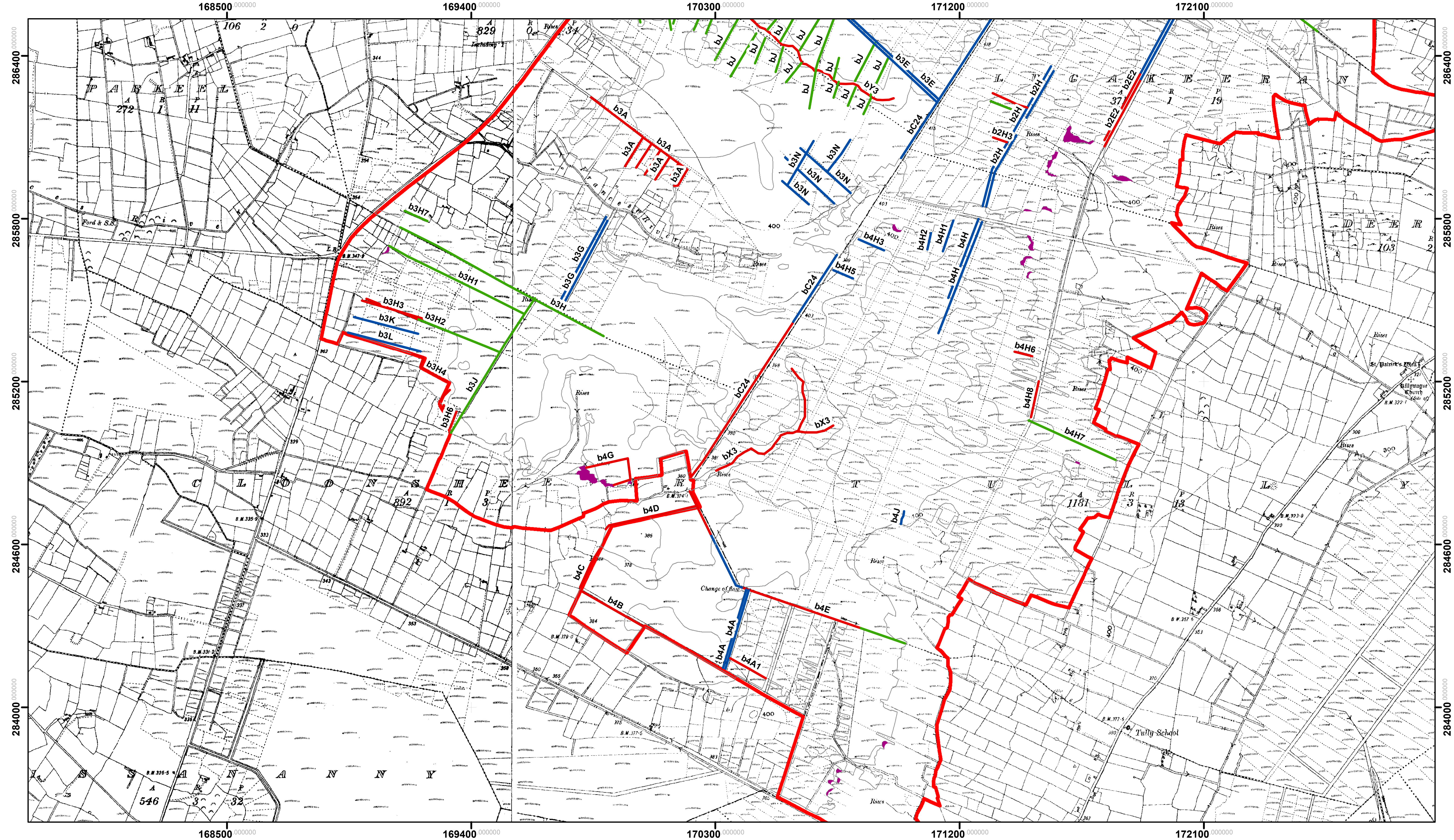
N

0 175 350 700 1,050 1,400 Meters

Legend

High Bog drainage

- Blocked:non-functional
- Blocked:reduced functional
- Not blocked:functional
- Not blocked:non-functional
- Not blocked:reduced functional
- Burnt high bog (2004/05-12/13)
- High bog cutaway (2004/05-10)
- SAC



Raised Bog Monitoring & Assessment Survey 2013

Map 3: Impacts (High bog drainage; Turf cutting;Fire events) (2 of 2)

Ordnance Survey Ireland Licence No EN 0059208

Ecology and Environmental Consultants Ireland Ltd.

Bellanagare SAC (000592)

Co. Roscommon

1:13,000

0 175 350 700 1,050 1,400 Meters

N

Legend

High Bog drainage

- Blocked:non-functional
- Blocked:reduced functional
- Not blocked:functional
- Not blocked:non-functional
- Not blocked:reduced functional
- Burnt high bog (2004/05-12/13)
- High bog cutaway (2004/05-10)
- SAC