

Monivea Bog (SAC 002352), Co. Galway

Executive Summary

This survey, carried out in October 2012, aimed to assess the conservation status of habitats listed on Annex I of the European Habitats Directive (92/43EEC) on the high bog at Monivea Bog. Vegetation was described and mapped based on raised bog ecotope vegetation community complexes (Kelly and Schouten, 2002). The following Annex I habitats occur: Active Raised Bog, Degraded Raised Bog and Depressions on peat substrates of the Rhynchosporion.

Active Raised Bog covers 7.03ha (5.32%) of the high bog area. High quality Active Raised Bog consists of central ecotope (0.97ha) featuring interconnecting *Sphagnum* pools and lawns dominated by *S. cuspidatum* and *S. papillosum* with the *Sphagnum* cover approaching 100% in certain locations and active flush (2.08ha) that extends out from an open water lake. Sub-central ecotope is also present (3.98ha) and is more variable in quality with the *Sphagnum* cover ranging from 34 to 75%.

Degraded Raised Bog covers 125.14ha (94.68%) of the high bog area. It is drier than Active Raised Bog and supports a lower density of *Sphagnum* mosses, although *Sphagnum* cover is as high as 50% in places. 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. Both *Rhynchospora alba* and *R. fusca* were recorded on Monivea Bog.

Only very limited restoration works have been undertaken to date at Monivea Bog and have been restricted to a 9.3ha area to the north-west of the high bog that was formerly a *Pinus contorta* plantation, but is now part of the Coillte Life project (LIFE09 NAT/IE/000222) to restore raised bogs. However, although positive measures have been undertaken (and are scheduled to be carried out periodically until 2015) including the removal of the plantation in 2006, the removal of naturally regenerating conifers (annually from 2012 to 2015) and the installation of peat dams (2012

and 2013) as well as hydrological and vegetation monitoring, the restoration area is bounded to the south by a deep drain (excavated to the mineral soil), which cannot at this time be blocked (due to the land to the south of the drain being in private ownership), and thus the restoration area would currently appear to be a separate hydrological unit to the rest of the SAC at Monivea Bog including the high bog (Conaghan, in prep.) meaning that any influence on the high bog hydrology and thus on the high bog habitats is likely to be negligible.

The current conservation objective for Monivea 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 109.88ha. The objective in relation to Structure and Functions (S&Fs) is that at least half of the Active Raised Bog area should be made up of the central ecotope and active flush (i.e. the wetter vegetation communities). These values have been set as Favourable Reference Values or FRVs until more site specific values can be set based on hydrological and topographical studies. The objective for Degraded Raised Bog is for the sub-marginal area to be restored to active peat forming communities as stated above and that no loss or degradation of any kind occurs. Although FRVs could not be established for the *Rhynchosporion* depressions, the objectives are to increase its extent and to improve its quality to values associated with a favourable conservation status of Active Raised Bog. Therefore, the habitat's objectives are indirectly associated with Active Raised Bog objectives.

There has been almost no change in the area of Active Raised Bog (7.03ha, an increase of 0.01ha) at Monivea Bog from 2005 to 2012. The increase of 0.01ha is the result of the infilling of one of the small open water lakes recorded in 2005. This area is now mapped as active flush as the lake has become largely infilled with *Sphagnum*. In comparison with the early 1900's six inch map the original bog lake shown to the northwest of the high bog has disappeared and being replaced by another bog lake 100m to the southeast. These changes are almost certainly due to regional changes in water pressure under the bog, due to marginal drainage. Subsidence on the high bog could occasionally lead to localised rewetting of the surface and the formation of small depressions. This type of depressions associated with subsidence has been seen to occur locally at Clara Bog. These localised depressions were associated with increased water losses through the base of the bog due to drainage and/or turf cutting in marginal areas which drain more permeable layers under the bog. The creation of such enclosed hollows will usually result in steeper slopes and increased drying out in the surrounding high bog area. Such changes, although they may in some cases

locally favour Active Raised Bog, occur at the expense of irreversible long terms changes in the topography/hydrology of the bog.

The mapped distribution of Active Raised Bog habitat has changed somewhat, although all such changes are attributed to the more comprehensive mapping exercise employed in the current survey or in some cases to vegetation re-interpretation. Two small new sub-central areas (**Sc8** and **Sc9**) have been described at the site and one small active flush (**V**), while two small sub-central areas recorded in 2005 (**Sc5** and **Sc7**) are no longer present on the high bog. These changes are considered to be the result of more comprehensive surveying in 2012. There have also been changes in the boundaries of the central ecotope (**C1** and **C2**) with **C1** mapped as significantly larger in 2012 than in 2005. Again, however, the area into which **C1** has been expanded into was not surveyed in 2005 and thus this is unlikely to represent a real change either. Similarly, there have been changes to the boundaries of the sub-central ecotope with **Sc1** and **Sc4** mapped as slightly larger in 2012 and **Sc2**, **Sc3** and **Sc6** mapped as slightly smaller. These mapping changes can also be attributed to the more intensive mapping effort involved in the 2012 survey. The active part of flush **X** is mapped as slightly smaller and this is attributed to the re-interpretation of vegetation as part of its former extent is now deemed to be part of **Sc1**. Part of the apparent losses in **Sc3** are also likely to be due to vegetation re-interpretation as this was described as a mosaic of sub-marginal and sub-central ecotope in 2005, but was mapped entirely as sub-central ecotope.

Peat cutting and drainage are the most threatening current activities at the site. 4.2ha of high bog have been lost in the reporting period due to peat cutting and this activity is considered to be the reason for the decline in Degraded Raised Bog in the north-eastern lobe of high bog. 1.9km of drains remain functional and 2.4km reduced functional. An extensive network of drains is also found on the cutover along the entire eastern length and part of the northern length of high bog. In addition, a severe fire event damaged 15.68ha (11.86%) the high bog in the reporting period.

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

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

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

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

Site identification

SAC Site Code	002352	6" Sheet:	Ga 71
Grid Reference:	E 154600 / N 234800	1:50,000 Sheet:	46
High Bog area (ha):	132.17ha ¹		
Dates of Visit:	22, 23 & 25/10/12		
Townlands:	Lenamore, Newcastle, Glennaslat and Corrantarramud		

¹ The current extent of the high bog is 132.17ha, while that reported in 2005 was 141.59ha (Fernandez *et al.*, 2005). This discrepancy is partially the result of more accurate mapping of the high bog edge by using the higher resolution 2010 aerial images compared to those used in 2005. High bog area has also decreased by 4.21ha in the 2004/05-2010 period due to peat cutting. The actual high bog extent in 2004 was 136.38ha (see tables 8.1 and 8.3 2005 (amended) figures).

Site location

Monivea Bog is situated just to the SE of Monivea town and 5km to the north-east of Athenry in Co. Galway. The Killaclogher River runs close to the eastern edge of the site. Kelly *et al.* (1995) grouped Monivea Bog with the raised bogs of mid-west Galway, which also includes Addergoole Bog (Part of Lough Corrib SAC 000297), which lies 24km to the west of Monivea Bog. Killaclogher Bog (NHA 001280) lies 5km to the north and Lough Tee Bog (NHA 000307) 5km to the east.

The site may be accessed from a bog road that runs into the E of the high bog. This in turn is accessed from the Newcastle to Monivea road.

Description of the survey

The survey was carried out in October 2012 and involved a vegetation survey of the high bog at Monivea Bog and the recording of impacting activities affecting high bog vegetation. A similar survey was carried out in 2005 by Fernandez *et al.* (2005). High bog vegetation was described and mapped, based on Raised Bog ecotope vegetation community complexes developed by Kelly and Schouten (2002). Detailed notes were taken on each community complex and any flushed areas that were present. These included: species lists; estimation of % cover of dominant species; percentage *Sphagnum* cover; evidence of damage (due to burning, peat cutting or drainage); micro-topography; ground firmness; and presence of *Cladonia* species. A list of photographic 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 Monivea Bog was re-surveyed. Sections mapped as sub-marginal, sub-central and central ecotope in 2005 were surveyed in more detail. These are the areas where changes were likely to have occurred. Quadrats, which describe the micro-topographical features and indicator species, recorded in the 2005 project (Fernandez *et al.* 2005) were re-surveyed (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

Monivea Bog has a crescent shape as a result of peat cutting. This bog has been classified as an Intermediate Raised Bog and geomorphologically as a Basin Bog (Cross, 1990). There is a small lake at the northwest of the high bog and it is associated with a long flush, which traverses the site in a northwest to southeast direction. This drainage feature divides the high bog in two lobes. The presence of the lake adds interest to the site. It is one of the most westerly examples of relatively intact raised bog in the country (Cross, 1990).

Ecological Information

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

The following Raised Bog EU Annex I habitats, are found in Monivea 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 Monivea Bog is 7.03ha (5.32% of the high bog), which is an increase of 2.89ha since 1994. This increase is likely to have been caused by changes in the hydrology of the high bog brought about by subsidence that has resulted in the north-west of the high bog getting wetter.

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

Central ecotope (0.97ha) was found at two locations (**C1** and **C2**) (see Appendix IV, Map 1). Three community complex types were recorded. Complex 14 characterised the central area of **C2** and represented the best quality central ecotope with interconnecting pools covering 51-75% and the *Sphagnum* cover ranging from 91 to 100%. There were occasional tall hummocks as well as low hummocks and lawns. The *Sphagnum* layer was dominated by *S. cuspidatum* and *S. papillosum* with *S. capillifolium*, *S. magellanicum* and *S. tenellum* also recorded. *Calluna vulgaris*, *Eriophorum vaginatum* and *Rhynchospora alba* were the most abundant vascular plants with *R. fusca* was also present. The flush indicators *Aulacomnium palustre* and *Polytrichum strictum* were also recorded. Complex 15 characterised **C1** and had a pool cover of 26-33% and a *Sphagnum* cover ranging from 76 to 90% dominated by *S. cuspidatum* and *S. magellanicum* with *S. capillifolium*, *S. austinii*, *S. papillosum* and *S. denticulatum* also recorded. *Calluna vulgaris* and *Rhynchospora alba* were the most abundant vascular plants. Complex 10/15 characterised the northern sections of **C2** and had a pool cover of 4-10% and a *Sphagnum* cover ranging from 91 to 100% dominated by lawns of *S. magellanicum* and *S. papillosum*. *S. austinii* and *S. fuscum* were both recorded in this area. *Calluna vulgaris* and *Narthecium ossifragum* were the most abundant vascular plants.

Six community complex types were recorded sub-central ecotope (3.98ha). Complex 4/10 was the most common, characterising **Sc2** and the eastern section of **Sc1**. The *Sphagnum* cover ranged from 51 to 75% and was dominated by lawns of *S. papillosum* and hummocks of *S. capillifolium* with *S. cuspidatum*, *S. austinii*, *S. fuscum* and *S. tenellum* also recorded. *Calluna vulgaris* and *Rhynchospora alba* were the most abundant vascular plants. Complex 9/7/10 was found in areas of **Sc1**, mostly where it graded into active flush. The *Sphagnum* cover ranged from 76 to 90% and was dominated by hummocks of *S. capillifolium* with tall hummocks of *S. austinii* recorded as frequent. *Calluna vulgaris* was by far the most abundant vascular plant and flush indicators were also recorded such as *Empetrum nigrum*, *Molinia caerulea*, *Carex panicea*, *Vaccinium oxycoccos* and *Aulacomnium palustre*.

Complex 9/10 and 9a/10 covered small areas of sub-central ecotope while complex 3/10 dominated in **Sc3**, **Sc8** and **Sc9**. The *Sphagnum* cover ranged from 51 to 75% and was dominated by *S. capillifolium* and *S. papillosum* though hummocks of *S. austinii* were frequent. *Carex panicea*, *Erica tetralix*, *Calluna vulgaris*, *Narthecium ossifragum* and *Eriophorum vaginatum* were the most abundant vascular plants. Complex 6/10 dominated **Sc4**, which had been burnt recently (but prior to 2010). The *Sphagnum* cover ranged from 34 to 75% and was dominated by low hummocks and lawns of *S. papillosum* though hummocks of *S. austinii* were again frequent. *Narthecium ossifragum* was by far the most abundant vascular plant.

Two active flushes (2.08ha) were recorded on Monivea Bog (flush **V** and **X**). Flush **V** was a very small flush, easily distinguished from the surrounding sub-marginal vegetation by the presence of *Molinia caerulea*. It had a *Sphagnum* cover of 51-75% and was found in a depression towards the south of the high bog. Flush **X** was a relatively large feature, the active component of which was found in the north-west of the high bog, mostly in the area south of the open water lake and north of **C2**. The *Sphagnum* cover ranged from 51-90% and the vegetation was variable with *Molinia caerulea*, *Calluna vulgaris*, *Erica tetralix*, *Eriophorum vaginatum*, *E. angustifolium*, *Carex panicea*, *Andromeda polifolia*, *Empetrum nigrum*, *Vaccinium oxycoccos*, *Aulacomnium palustre*, *Polytrichum strictum*, *Pleurozium schreberi*, *Sphagnum capillifolium*, *S. tenellum*, *S. papillosum*, *S. magellanicum*, *S. fallax*, *S. cuspidatum* and *S. austinii* all recorded.

Degraded Raised Bog (7120)

The current area of Degraded Raised Bog at Monivea Bog is 125.14ha (94.68% of the high bog).

Degraded Raised Bog includes the sub-marginal, marginal and face bank ecotope, as well as inactive flush. 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 (90.54ha) ecotope features the most developed micro-topography within Degraded Raised Bog. Complex 9/7/6 and 9/7/2 are the best quality sub-marginal community complexes recorded at Monivea Bog. However, pools are largely absent with the micro-topography dominated by hummocks and hollows. The *Sphagnum* cover ranged from 26 to 50% and was dominated mainly by *S. capillifolium*. *Calluna vulgaris* and *Eriophorum vaginatum* were the most abundant vascular plants as well as *Narthecium ossifragum* in 9/7/6 and *Trichophorum germanicum* in 9/7/2. 9/7/2 was often recorded in areas that graded into sub-central ecotope and its presence may be related to water flow patterns. Other sub-marginal community complexes recorded were all

variants of complex 6/3 (6/3, 6/3/4, 6/3 (RB), 6/3/4 (RB). The *Sphagnum* cover in these areas generally ranged from 11 to 33% while *Narthecium ossifragum*, *Carex panicea*, *Calluna vulgaris* and *Rhynchospora alba* were the most abundant vascular plants.

Marginal ecotope (20.76ha) was slightly drier than sub-marginal ecotope with Complex 6/7/3 the only community complex recorded. The *Sphagnum* cover was even lower here than in the sub-marginal ecotope (<10%) and the vegetation was characterised by a higher cover of *Carex panicea*, *Narthecium ossifragum*, *Trichophorum germanicum*, and *Calluna vulgaris*.

Face bank ecotope (0.26ha) is characterised by firm ground, tall *Calluna vulgaris*, poor *Sphagnum* cover and a flat micro-topography. This ecotope covers a small area along the high bog edge towards the east of the site.

The high bog also features several inactive flushes (flush U, W, Y and Z as well as part of flush X) totalling 13.33ha. These flushes were mostly dominated by *Molinia caerulea* with a *Sphagnum* cover averaging 11 to 25%. Flush X supported a number of *Pinus sylvestris* (up to 4m in height).

Depressions on peat substrates of the Rhynchosporion (7150)

Rhynchosporion vegetation is widespread on Monivea Bog. It is found in both Active and Degraded Raised Bog, but tends to be best developed and most stable in the wettest areas of Active Raised Bog. In these areas, the Rhynchosporion vegetation occurs within *Sphagnum* hollows and along *Sphagnum* pool edges and on lawns. It was found to be most common on Monivea Bog in complex 14 and 15 (central), complex 4/10 (sub-central) and complex 6/3/4 and 6/3/4(RB) (sub-marginal). Typical plant species include *Rhynchospora alba*, *Sphagnum cuspidatum*, *S. magellanicum*, *S. papillosum*, *Drosera anglica* and *Eriophorum angustifolium*. *Rhynchospora fusca* was also recorded from a number of pools in complex 14 on Monivea Bog.

R. alba was also found within degraded raised bog, but always associated with wet features such as hollows and relict pools.

Detailed vegetation description of the high bog

A detailed description of high bog vegetation recorded during the 2012 survey of Monivea 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 Monivea 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	4.2ha of the high bog cut away	Inside High Bog: 97 different locations along north-east, south-east and north-west of high bog	7120
C01.03	Peat extraction	L	-1	4.2ha of the high bog cut away	""	7110/7150
J02.07	Drainage	M	-1	4.358km ¹	Inside High Bog	7110/7120/7150
J02.07	Drainage	H	-1	n/av	Outside High Bog	7110/7120/7150
J01	Fire	L	-1	15.68ha	Inside 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	11.4ha	Outside High Bog	7110/7120/7150
B02.02	Forestry clearance	L	+1	9.3ha	Outside High Bog	7110/7120/7150
4.2	Restoring/Improving the hydrological regime	L	+1	n/av	Outside High Bog	7110/7120/7150

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

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

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 97 locations along the southeast (28 locations (plots)), northeast (67 locations) and northwest (2 locations) sections of high bog in the 2004-2010 period. This has reduced the area of high bog by 4.2ha. 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 95 plots were cut on the high bog at Monivea Bog in 2010/2011; 78 were cut in 2012 and 49 in 2013. Thus the area of high bog lost on Monivea Bog during the reporting period is in excess of 4.2ha, but since there is no aerial photography available post 2010, the area lost from 2010 to 2012 cannot be estimated.

The impact of peat cutting on ARB (7110) and Depressions on peat substrates of the *Rhynchosporion* (7150) is thought to be low as there has been no loss of habitat during the reporting period. However, the continuation of these activities will prevent the recovery of the high bog, and the recovery of ARB towards FRV's. Restoration works cannot be employed until such activities stop. It should also be borne in mind that peat cutting has already had a serious negative impact over a long period at this site, indicated by the fact that ARB covers only a very small area (7.03ha or 5.32% of the high bog) and is 93.60% below the FRV target. The current ARB at the site is almost totally confined to the north-west of the site while the active peat cutting occurs mostly along the eastern margins of the high bog.

Habitat losses associated with peat cutting in the current reporting period have been confined mostly to the marginal ecotope (2.4ha), but have also occurred within sub-marginal ecotope (1.0ha) and inactive flush (0.8ha). Thus, the activity is assessed as having a negative impact of high importance on Degraded Raised Bog.

In addition to the impact of turf cutting in the current reporting period, old face banks and high bog and cutover drainage associated with cutting also continue to cause negative impacts on the high bog habitats.

Fernandez *et al.* (2005) reported that close to 66% of the high bog had been cut away since the 1840's, and estimated that 24% of the high bog margin was actively cut in 2003. The turf plots identified at the time were all thought to be hopper cut and associated with domestic usage though facebank heights of up to 3m were reported in places with associated cracking and slumping of the high bog. It was estimated that 7.0ha (4.8%) of the high bog was lost to peat cutting in the period 1995-2005. Thus, 11.2ha or 7.8% of the high bog has been lost to peat cutting in the last 15 years.

Drainage

High bog drainage

Table 6.2 shows that there has been a decrease of 0.426km in the length of functional drains and of 0.269km in the length of reduced functional drains. However, these decreases are the result of the drains being cut into by peat cutting and are thus not a positive development. The majority of drains on the high bog remain functional (1.93km) or reduced functional (2.43km). Reduced functional drains are also still impacting on high bog habitats and will continue to do so until they are blocked and become completely in-filled and thus non-functional.

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

No blockage of drains has occurred to date.

Table 6.2 High bog drainage summary

Status	2005 (km) ¹	2012 (km)	Change
NB: functional	2.354	1.928	(-)0.426
NB: reduced functional	2.699	2.430	(-)0.269
NB: non- functional	0.458	0.458	0.000
B: functional	0.000	0.000	0.000
B: reduced functional	0.000	0.000	0.000
B: non- functional	0.000	0.000	0.000

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

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

Table 6.3 below provides a more detail description of the drainage present on the high bog at Monivea Bog including any change in their functionality in the 2005 – 2012 reporting period (see Map 3).

Table 6.3 High bog drainage detail

Drain Name	Length (km)	2005 status	2012 status	Change	Comment
bA	0.025	NB: functional	NB: functional	No	
bB	0.031	NB: functional	NB: functional	No	
bC	0.051	NB: functional	NB: functional	No	
bD	0.073	NB: functional	NB: functional	No	
bE	0.040	NB: reduced functional	NB: reduced functional	No	
bF	0.012	NB: reduced functional	NB: reduced functional	No	
bG	0.022	NB: reduced	NB: reduced	No	

		functional	functional		
bH	0.024	NB: reduced functional	NB: reduced functional	No	
bI1;2	0.507	NB: reduced functional	NB: reduced functional	No	
bJ	0.127	NB: reduced functional	NB: reduced functional	No	
bK	0.052	NB: reduced functional	NB: reduced functional	No	
bL	0.015	NB: functional	NB: functional	No	
bM	0.364	NB: functional	NB: functional	No	Some sections of double drain remain functional. Southern section of western drains section of drain was wrongly classified as non-functional in 2004
bM	0.602	NB: reduced functional	NB: reduced functional	No	Some sections of double drain remain reduced functional
bM1	0.040	NB: non-functional	NB: non-functional	No	This drain was wrongly classified as reduced functional in 2004
bO	0.063	NB: reduced functional	NB: reduced functional	No	
bP1-3	0.171	NB: reduced functional	NB: reduced functional	No	
bQ	0.032	NB: functional	NB: functional	No	
bR	0.112	NB: functional	NB: functional	No	
bS1-4	0.199	NB: functional	NB: functional	No	
bT1-3	0.105	NB: functional	NB: functional	No	
bU	0.063	NB: functional	NB: functional	No	
bV	0.039	NB: functional	Not applicable	Yes	No longer present, section of high bog where drain was found has been cut away
bW1	0.113	NB: reduced functional	NB: reduced functional	No	
bW2;3	0.216	NB: functional	NB: functional	No	Drain bW3 was wrongly classified as reduced functional in 2004
bX	0.111	NB: functional	NB: functional	No	
bX1-6	0.473	NB: functional	NB: functional	No	
bX7;8	0.143	NB: reduced functional	NB: reduced functional	No	

bY1;2	0.238	NB: reduced functional	NB: reduced functional	No	
bZ	0.102	NB: reduced functional	NB: reduced functional	No	
D1	0.418	NB: non-functional	NB: non- functional	No	
D2	0.142	NB: reduced functional	NB: reduced functional	No	
D3	0.042	NB: reduced functional	NB: reduced functional	No	Drain already present in 2005 but not mapped
D4	0.030	NB: reduced functional	NB: reduced functional	No	Drain already present in 2005 but not mapped
D5	0.058	NB: functional	NB: functional	No	Drain already present in 2005 but not mapped

Bog margin drainage

The cutover areas were not surveyed for drains during 2012.

However, it is obvious from the aerial photograph that there is an extensive network of drains associated with active peat cutting present on the cutover along the entire eastern and along part of the northern length of the high bog. These drains continue to drain the high bog and impacting on high bog habitats. Kelly *et al.* (1995) noted that much of these drains moved water east to the Killaclogher River and also noted the presence of a small zone of upwelling regional ground water at the south-west of the site on the western cutover, which is overgrown.

Drainage maintenance continues on the cutover where active peat cutting is present and the adjacent agricultural land appears to be rather intensively managed. Furthermore, the Killaclogher River runs close to much of the eastern extent of the cutover at Monivea Bog. Dredging works appear to have been carried out on it in the past, the impact of which on high bog habitats is unknown.

Bog margin drainage is considered to have a high importance/impact on high bog habitats. In comparison with the early 1900's six inch map the original bog lake shown to the northwest of the high bog has disappeared and being replaced by another bog lake 100m to the southeast. In addition, a small area of open water 70m to the southeast of the remaining lake which was present in 2004/5 has since infilled. These changes are almost certainly due to regional changes in water pressure under the bog, due to marginal drainage.

Fire history

A fire burnt 15.68ha (11.9%) of the high bog in the west of the site in 2010. No signs of a recent burn were noted during the 2005 survey while Kelly *et al.* (1995) noted evidence of a recent burn in the south of the high bog in, and to the south east of, flush Y at the time of their survey. Douglas and Mooney (1984) noted that the NW half of the bog was probably burnt circa 1981/82 and that a small area had been burnt in the south-east in 1984.

Fire is considered to have a low importance/impact on high bog habitats.

Invasive species

Some scattered pines (*Pinus contorta* and *P. sylvestris*) have been recorded on the high bog, but do not appear to be spreading. A single *Rhododendron ponticum* shrub (<1m) was also recorded to the south of the small lake by Fernandez *et al.* (2005). *Campylopus introflexus* was also recorded in scattered across parts of the high bog.

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

Afforestation and forestry management

There is no forestry on the high bog, but there is one plantation (11.4ha) to the north of the site (ca. 250m from the high bog). Only a small section of this plantation lies within the SAC. According to Kelly *et al.* (1995) this area was shown to be wooded on the 1910 6" sheet (mixed deciduous and conifer woodland) and is also present on the 1970s aerial photo as well as being noted by Kelly *et al.* in 1995 and Fernandez *et al.* (2005).

Another plantation was noted by Kelly *et al.* (1995) and Fernandez *et al.* (2005) to the north-west of the high bog (lying 125m from the high bog). This *Pinus contorta* plantation was felled in 2006 and its area (9.3ha) is now part of the Coillte Life project (LIFE09 NAT/IE/000222) to restore raised bogs (Conaghan, in prep.). However, the restoration area is bounded to the south by a deep drain (excavated to the mineral soil), which cannot at this time be blocked (due to the land to the south of the drain being in private ownership), and thus the restoration area would currently appear to be hydrologically isolated from rest of the SAC at Monivea Bog. Nonetheless restoration work carried out to date (and to be carried out periodically until 2015) includes the removal of naturally regenerating conifers and the installation of peat dams as well as hydrological and vegetation monitoring. However, the cutover nature of the restoration area combined with the fact that the peat depth is shallow (<1m) indicates that the development of wet willow scrub in the restoration site is inevitable. However, in terms of ecological value, it must be noted that the development of

such scrub along the margins of a raised bog is positively viewed as an important wildlife habitat in itself.

Thus, although a conifer plantation has been removed in the reporting period and its removal is considered as positive from an ecological point of view, the fact that the restoration area appears to be a separate hydrological unit to the high bog means that any influence on the high bog hydrology and thus on the high bog habitats is likely to be negligible.

Other impacting activities

No other significant impacting activities were noted or recorded in 2012 impacting high bog habitats in the 2005-2012 reporting period.

Conservation activities

A *Pinus contorta* plantation that lay within the SAC, 125m to the north-west of the high bog was felled in 2006 and its area (9.3ha) is now part of the Coillte Life project (LIFE09 NAT/IE/000222) to restore raised bogs (Conaghan, in prep.). In October 2012, restoration works undertaken included the fell to waste of naturally regenerating *Pinus contorta* and the construction of peat dams along the perimeter of the site anywhere there was a significant water flow out of the restoration area. The density of naturally regenerating pine at the site is not great so that their removal is relatively straightforward. However, drainage patterns are complex because of the fact that the restoration site has been cutover in the past. Thus, further drain blocking work is scheduled for 2013 when the peat dams constructed in 2012 will be made more substantial and additional drain blocking will be carried out in the interior of the restoration area. The shallow peat depth (<1m) throughout, however, means an improvement in water levels will probably be restricted to the lower lying areas where there is a depth of residual peat. The shallow depth of peat combined with the cutover nature of the site indicates that the development of wet willow scrub in the restoration site is inevitable. However, in terms of ecological value, it must be noted that the development of such scrub along the margins of a raised bog is positively viewed as an important wildlife habitat in itself. On the other hand, it should also be noted that the restoration area is bounded to the south by a deep drain (excavated to the mineral soil), which cannot at this time be blocked (due to the land to the south of the drain being in private ownership), and thus the restoration area would currently appear to be hydrologically isolated from rest of the SAC at Monivea Bog.

Cutover drainage blocking is reported as positive management actions under Restoring/Improving the hydrological regime (4.2) within table 6.1.

Conservation status assessment

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

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

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

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

Active Raised Bog (7110)

Area

Although table 8.1 indicates almost no change in the area (an increase of 0.01ha) of Active Raised Bog, there have been some changes to the distribution of habitat and a number of new Active Raised Bog areas have been identified and mapped.

The increase of 0.01ha is the result of the infilling of one of the small open water lakes recorded in 2005. This area is now mapped as active flush as the lake has become largely infilled with *Sphagnum*. In comparison with the early 1900's six inch map the original bog lake shown to the northwest of the high bog has disappeared and being replaced by another bog lake 100m to the southeast. These changes are almost certainly due to regional changes in water pressure under the bog, due to marginal drainage.

Two new, small sub-central areas – **Sc8** to the west of the high bog, and **Sc9**, towards the centre of the high bog - have been mapped. Neither are thought to represent a real change to the high bog, as there was a previous lack of mapping points in these areas (as the maps by Fernandez *et al.*, 2005 clearly indicate). Flush **V** in the south-east of the high bog is also newly recorded as a small area of active flush, but again, and for similar reasons this is unlikely to represent a real change.

On the other hand, two small sub-central areas recorded in 2005 – **Sc5** to the south and **Sc7** in the east of the high bog are no longer present on the high bog. However these areas corresponded with only a single isolated sub-central ecotope dot in 2005. These isolated dots were again recorded in 2012, but the areas were considered too small to map. Thus, these losses are not considered to be a real change but a result of more comprehensive surveying in 2012 which resulted in more accurate mapping.

There have also been changes in the boundaries of the central ecotope (**C1** and **C2**) with **C1** mapped as significantly larger in 2012 than in 2005. Again, however, the area into which **C1** has been expanded into was not surveyed in 2005 and thus this is unlikely to represent a real change either. Similarly, there have been changes to the boundaries of the sub-central ecotope with **Sc1** and **Sc4** mapped as slightly larger in 2012 and **Sc2**, **Sc3** and **Sc6** mapped as slightly smaller. These mapping changes can also be attributed to the more intensive mapping effort involved in the 2012 survey. The active part of flush **X** is also mapped as slightly smaller and this is attributed to the re-interpretation of vegetation as part of its former extent is now deemed to be part of **Sc1**. Part of the apparent losses in **Sc3** are also likely to be due to vegetation re-interpretation as Complex 3/10 described from here in 2005 was described as forming a mosaic with the sub-marginal complex 3/9 in this area and as having a *Sphagnum* cover of 30-40%, but was mapped entirely as sub-central ecotope.

The favourable reference value (FRV) for Area is considered to be the sum of Active Raised Bog (central and sub-central ecotopes) plus sub-marginal ecotope when the Habitats Directive came into force in 1994 (see table 8.4). Therefore, Active Raised Bog Area FRV is 109.88ha (based on 1994/5 Kelly (1995) figures amended by Fernandez *et al.* (2005), see tables 8.1 and 8.4 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 of 7.03ha is 93.60% below the FRV. A current Area value more than 15% below FRV falls into the **Unfavourable Bad** assessment category. A long term (1994/5-2012) trend indicates an increase in the area of Active Raised Bog at the site (2.89ha) (see table 8.1). However, part of this 'increase' is likely to be as a result of more comprehensive surveying in 2012 rather than

an actual increase on the ground. A more recent and short term trend analysis (7 years; 2005-2012) indicates almost no change in the area (an increase of 0.01ha) of Active Raised Bog. Therefore, the habitat Area is given a **Stable** trend assessment. The increase of 0.01ha is the result of the infilling of one of the small open water lakes recorded in 2005. This area is now mapped as active flush as the lake has become largely infilled with *Sphagnum*. Changes in the northwest section of the high bog are almost certainly due to regional changes in water pressure under the bog, due to marginal drainage. Subsidence on the high bog could occasionally lead to localised rewetting of the surface and the formation of small depressions. This type of depressions associated with subsidence has been seen to occur locally at Clara Bog. These localised depressions were associated with increased water losses through the base of the bog due to drainage and/or turf cutting in marginal areas which drain more permeable layers under the bog. The creation of such enclosed hollows will usually result in steeper slopes and increased drying out in the surrounding high bog area. Such changes, although they may in some cases locally favour Active Raised Bog, occur at the expense of irreversible long terms changes in the topography/hydrology of the bog.

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

Structure & Functions

The FRV for S&Fs is for at least half of the active raised bog area to be made up of central and active flush, i.e. the higher quality wetter vegetation communities. This value is 3.52ha (half of 7.03ha, the current area of Active Raised Bog). The current value is 3.05ha which is 13.35% below the FRV. As a value falling between 5% and 25% below FRV falls into the Unfavourable-Inadequate assessment category, S&Fs are given an **Unfavourable-Inadequate** assessment.

A long term (1994/5-2012) trend indicates a decrease (of 1.09ha) in the combined area of central ecotope and active flush, whereas a short term trend (7 years; 2005-2012) shows almost no change (an increase of 0.01ha), and the S&Fs are therefore given a **Stable** trend.

Quadrats analysis (**Qc1**, **Qsc1**, **Qsc2** and **Qsc3**) indicates the following:

Qc1: There was a slight variation in the quadrat data compared to 2005: there has been a slight increase both in the cover of pools (from 11-25% in 2005 to 26-33% in 2012) and in the overall *Sphagnum* cover (51-75% in 2005 to 76-90% in 2012). However, there has been a decrease in the cover of *S. cuspidatum* (34-50% in 2005 to 11-25% in 2012) while there has been an increase in the cover of *S. austinii* (<4% in 2005 to 11-25% in 2012) and *S. papillosum* (<4% in 2005 to 4-10% in 2012). The cover of *S. magellanicum* (11-25%), *S. capillifolium* (4-10%) and *S. denticulatum* (<4%) has remained the

same. A slight decrease in the cover of *Trichophorum germanicum* (4-10% in 2005 to <4% in 2012) and *Rhynchospora alba* (11-25% in 2005 to 4-10% in 2012) was also recorded as well as an increase in the cover of *Calluna vulgaris* (4-10% in 2005 to 11-25% in 2012) and *Cladonia portentosa* (<4% in 2005 to 11-25% in 2012). However, these changes may merely be the result of a discrepancy in the quadrat location (up to 2m) between both year surveys, rather than an actual change.

Qsc1: There was a slight variation in the quadrat data compared to 2005: the cover of pools has remained the same (11-25%) while the overall *Sphagnum* cover has increased (from 34-50% in 2005 to 51-75% in 2012). However, there has been a decrease in the cover of *S. austinii* (4-10% in 2005 to “absent” in 2012) while there has been an increase in the cover of *S. papillosum* (4-10% in 2005 to 26-33% in 2012) and *S. magellanicum* (4-10% in 2005 to 11-25% in 2012). The cover of *S. cuspidatum* (4-10%) and *S. capillifolium* (4-10%) has remained the same. A slight increase in the cover of *Trichophorum germanicum* (“absent” in 2005 to <4% in 2012) and *Narthecium ossifragum* (<4% in 2005 to 4-10% in 2012) was also recorded as well as a decrease in the cover of *Calluna vulgaris* (26-33% in 2005 to 11-25% in 2012) and *Rhynchospora alba* (11-25% in 2005 to 4-10% in 2012). However, these changes may merely be the result of a discrepancy in the quadrat location (up to 2m) between both year surveys, rather than an actual change.

Qsc2: There was a moderate variation in the quadrat data compared to 2005: the cover of pools has increased (from “absent” in 2005 to 4-10% in 2012) while the overall *Sphagnum* cover has decreased (from 34-50% in 2005 to 26-33% in 2012). There has been a decrease in the cover of *S. papillosum* (26-33% in 2005 to 11-25% in 2012) and *S. magellanicum* (4-10% in 2005 to “absent” in 2012) while there has been an increase in the cover of *S. austinii* (“absent” in 2005 to <4% in 2012) and *S. subnitens* (“absent” in 2005 to <4% in 2012). The cover of *S. cuspidatum* (<4%) and *S. capillifolium* (4-10%) has remained the same. There has been a decrease in the cover of *Trichophorum germanicum* (4-10% in 2005 to “absent” in 2012) and *Rhynchospora alba* (11-25% in 2005 to <4% in 2012) as well as a significant increase in the cover of *Narthecium ossifragum* (11-25% in 2005 to 51-75% in 2012). The increase in the cover of *Narthecium ossifragum* as well as some of the other changes is likely to have been caused by the fire which affected this area in 2010. However, some of the 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. Indeed, the total *Sphagnum* cover in the area immediately south of the quadrat was estimated at 51-75% in 2012.

Qsc3: There was a slight variation in the quadrat data compared to 2005: the cover of pools has decreased (from <4% in 2005 to “absent” in 2012) while the overall *Sphagnum* cover has increased (from 34-50% in 2005 to 51-75% in 2012). However, there has been a decrease in the cover of *S.*

austinii (<4% in 2005 to “absent” in 2012) and *S. cuspidatum* (4-10% in 2005 to “absent” in 2012) while there has been an increase in the cover of *S. magellanicum* (“absent” in 2005 to 11-25% in 2012). The cover of *S. papillosum* (4-10%) and *S. capillifolium* (26-33%) has remained the same. A slight decrease in the cover of *Narthecium ossifragum* (4-10% in 2005 to <4% in 2012) was also recorded as well as an increase in the cover of *Calluna vulgaris* (26-33% in 2005 to 34-50% in 2012). However, these changes may merely be the result of a discrepancy in the quadrat location (up to 2m) between both year surveys, rather than an actual change.

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

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

Future Prospects

Habitat Area has remained unchanged and S&Fs are assessed as Stable in the current reporting period. However, there are still functional and reduced functional drains on the high bog, and others in the bog margins, such as those associated with cutover plots. Peat-cutting continues at the site, with 97 active turf cutting plots in the reporting period and an approximate 78 identified in 2012 and 49 in 2013. The high bog has been cutaway extensively and the current ARB area represents a particularly small percentage of the total high bog area. There are also no significant restoration measures at the site which could override the negative influence of impacting activities.

Habitat **Area** is currently 93.60% 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 13.35% below FRV (see table 8.4) and a Declining trend is also foreseen. Therefore S&Fs are expected to be 5 to 25% below FRV in the following two reporting periods. **S&Fs Future Prospects** are assessed as **Unfavourable Inadequate-Declining**. **The overall habitat's Future Prospects are Unfavourable Bad-Declining** (see table 8.5).

There is some potential for the restoration of cutover around the entire site, but particularly along the north-west, north, north-east, east, south-east and south, as the cutover is more extensive there. Furthermore the blocking of remaining functional and reduced-functional drains both on the high bog and cutover and the cessation of peat cutting is necessary. Cutover areas would be particularly

important in restoration works, as the possibilities of restoring the bog through the blocking of high bog drains are limited as these drains are relatively few in number and also rather short.

There has been one recent significant fire event affecting 11.9% of the high bog (including some areas of ARB – Sc4 and a small part of Sc8) in 2010, and such events have been regularly recorded since the 1980s. Such events should be curtailed in order to minimise potential damage to high bog habitats.

The overall conservation status of Active Raised Bog at Monivea 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	2005	2005 (amended)	2012	Change (2005-2012)	
	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	%
Central	0.93	0.49	0.97	0.97	0.00	0.00
Sub-central	0.00	3.71	3.98	3.98	0.00	0.00
Active flush	3.21	3.21	2.07	2.08	0.01	(+)0.48
Total	4.14	7.41	7.02	7.03	(+)0.01	(+)0.14

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

Note: Table 8.1 includes 2005 figures and 2005 amended figures. The latter shows the ecotope area believed to be present in 2005 after surveying improvements in 2012. The comparison between 2005 (amended) and 2012 illustrates the actual changes in ecotope area in the 2005-2012 period. Any change in ecotope area between the 2005 and the 2005 (amended) values is due to improvement in mapping accuracy and/or the result of a more comprehensive survey in 2012 (see table 8.2 for further detail).

Table 8.2 Assessment of changes in individual Active Raised Bog areas

Area	Quadrats	Trend	Comment	Quadrats analysis
C1	Qc1	Stable	Slight changes in boundary (larger). This change is the result of more comprehensive surveying in 2012 which resulted in more accurate mapping.	Slight variation in quadrat data: increase in the overall <i>Sphagnum</i> cover (from 51-75% to 76-90%) with an increase in the cover of <i>S. austinii</i> (<4% to 11-25%) but a decrease in <i>S. cuspidatum</i> (34-50% to 11-25%). However, these changes may merely be the result of a discrepancy in the quadrat location (up to 2m) between both year surveys, rather than an actual change.

Area	Quadrats	Trend	Comment	Quadrats analysis
C2	None	Stable	Slight changes in boundary (larger). This change is the result of more comprehensive surveying in 2012 which resulted in more accurate mapping.	
Sc1	Qsc3	Stable	Slight changes in boundary (larger). This change is a combination of more comprehensive surveying in 2012 which resulted in more accurate mapping as well as the re-interpretation of some of the vegetation as parts formerly mapped as active flush are now deemed to be part of Sc1.	Slight variation in the quadrat data: increase in the overall <i>Sphagnum</i> cover (34-50% to 51-75%) with an increase in the cover of <i>S. magellanicum</i> ("absent" to 11-25%) and a decrease in <i>S. austinii</i> (<4% to "absent") and <i>S. cuspidatum</i> (4-10% to "absent"). However, these changes may merely be the result of a discrepancy in the quadrat location (up to 2m) between both year surveys, rather than an actual change.
Sc2	Qsc1	Stable	Slight changes in boundary (smaller). This change is the result of more comprehensive surveying in 2012 which resulted in more accurate mapping.	Slight variation in the quadrat data: increase in the overall <i>Sphagnum</i> cover (34-50% to 51-75%) with an increase in the cover of <i>S. papillosum</i> (4-10% to 26-33%) and <i>S. magellanicum</i> (4-10% to 11-25%) and a decrease in <i>S. austinii</i> (4-10% to "absent"). However, these changes may merely be the result of a discrepancy in the quadrat location (up to 2m) between both year surveys, rather than an actual change.
Sc3	None	Stable (possibly decreasing)	Slight changes in boundary (smaller). This change is a combination of more comprehensive surveying in 2012 which resulted in more accurate mapping as well as the re-interpretation of some of the vegetation. In 2005, this area was described as a mosaic of sub-central and sub-marginal ecotopes, but was mapped entirely as sub-central.	
Sc4	Qsc2	Stable	Slight changes in boundary (larger). This change is the result of more comprehensive surveying in 2012 which resulted in more accurate mapping.	Moderate variation in the quadrat data: decrease in the overall <i>Sphagnum</i> cover (34-50% to 26-33%) with a decrease in the cover of <i>S. papillosum</i> (26-33% to 11-25%) and <i>S. magellanicum</i> (4-10% to "absent") and an increase in <i>S. austinii</i> and <i>S. subnitens</i> (both "absent" to <4%). A decrease in <i>Trichophorum germanicum</i> (4-

Area	Quadrats	Trend	Comment	Quadrats analysis
				10% to “absent”) and <i>Rhynchospora alba</i> (11-25% to <4%) as well as a significant increase in <i>Narthecium ossifragum</i> (11-25% to 51-75%). The increase in the cover of <i>Narthecium ossifragum</i> as well as some of the other changes is likely to have been caused by the fire which affected this area in 2010
Sc5	None	No longer present (stable)	This sub-central ecotope area was wrongly mapped as a polygon in 2005. However it only corresponded with an isolated sub-central ecotope dot, as confirmed in 2012. This is not a real change but a result of more comprehensive surveying in 2012 which resulted in more accurate mapping.	
Sc6	None	Stable	Slight changes in boundary (smaller). This change is the result of more comprehensive surveying in 2012 which resulted in more accurate mapping.	
Sc7	None	No longer present (stable)	This sub-central ecotope area was wrongly mapped as a polygon in 2005. However it only corresponded with an isolated sub-central ecotope dot, as confirmed in 2012. This is not a real change but a result of more comprehensive surveying in 2012 which resulted in more accurate mapping.	
Sc8	None	Unknown (possibly expanding)	This specific area was not comprehensively surveyed in 2005. This is likely to be the result of more comprehensive surveying in 2012 which resulted in more accurate mapping.	
Sc9	None	Unknown	""	
V	None	Unknown	""	
X	None	Stable	This change is a combination of more comprehensive surveying in 2012 which resulted in more accurate mapping as well as the re-interpretation of some of the vegetation as parts formerly mapped as active flush are now deemed to be part of Sc1.	

Degraded Raised Bog (7120)

Area

The Degraded Raised Bog FRV for Area is 22.29ha at Monivea Bog. This value corresponds with the difference between the current high bog area (132.17ha) and the Active Raised Bog FRV (109.88ha) 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 461.42% 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 Monivea Bog (see table 8.4).

Table 8.3 indicates that there has been a decrease (4.22ha) in the area of Degraded Raised Bog. The decrease has occurred as a result of peat cutting and therefore the habitat is given a **Decreasing** trend.

The Area of Degraded Raised Bog at Monivea 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 31.29ha (25% of 125.14ha, the current area of Degraded Raised Bog). The current marginal and face bank ecotopes area value (21.02ha) is 32.81% below 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 below FRV falls into the **Favourable** assessment category.

S&Fs trend is assessed based on actual changes within marginal and face banks ecotope (e.g. decreases due to rewetting processes or increases as a result of further drying out). Table 8.3 shows that there has been an increase in the area of marginal ecotope of 3.6ha. The area of face-bank ecotope has remained the same. Thus the combined increase of these two ecotopes equals 3.6ha or 20.67%. In addition, the 4.2ha loss of high bog to peat cutting has also largely taken from marginal ecotope. Indeed it is estimated that 2.4ha of marginal ecotope present in 2005 were cut from the high bog and thus lost to the high bog completely. This figure needs to be included in the assessment of the increase in marginal ecotope at Monivea Bog so that overall a 6ha increase should

be used for assessment, which equates to a 34.44% increase in marginal and face-bank ecotope. Thus, the DRB's S&Fs at Monivea Bog are given a **Declining** trend.

The increase in marginal ecotope during the reporting period was almost exclusively recorded in the north-eastern lobe of the high bog (east of flush X and particularly east of drain bM). This is the area where peat cutting is most intensive and thus high bog drying out processes associated with peat cutting appears to be affecting the high bog in this area.

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

The Structure & functions of Degraded Raised Bog at Monivea Bog are assessed as Favourable-Declining (see table 8.5).

Future Prospects

The area of Degraded Raised Bog has decreased (by 4.2ha) as a result of peat cutting. This activity has also damaged the habitat S&Fs particularly in the north-eastern lobe of the high bog. Peat cutting continues at the site and thus further habitat decreases in extent and quality are expected. Furthermore, drainage on the high bog and within the extensive cutover areas continues to damage the habitat and hinder its recovery to FRV's, as well as minimising the chances of converting marginal and facebank ecotopes to sub-marginal and/or Active Raised Bog. There are currently no significant remediation works at the site that might contribute to the restoration of good quality habitat.

There has been one recent significant fire event affecting 11.9% of the high bog in 2010, and such events have been regularly recorded since the 1980s. Such events should be curtailed in order to minimise potential damage to high bog habitats.

Habitat **Area** is currently 125.14% above FRV (see table 8.4) and a Decreasing trend is expected in the following two reporting periods (12 years). 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 32.81% below FRV (see table 8.4). A Declining trend is foreseen in the following two reporting periods. **S&Fs** are expected to remain below FRV. Thus, habitat's **S&Fs Future Prospects** are assessed as **Favourable-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	2005	2005 (amended)	2012	Change (2005-2012)	
	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	%
Sub-marginal	105.74	101.52	97.54	90.54	(-)7.00	(-)7.18
Marginal ²	17.74	9.16	17.16	20.76	(+)3.60	(+)20.98
Face bank ²	n/a	2.41	0.26	0.26	0.00	0.00
Inactive flush	17.24	16.90	14.14	13.33	(-)0.81	(-)5.73
Open water	0.29	0.29	0.26	0.25	(-)0.01	(-)3.85
Total	141.01	130.28	129.36	125.14	(-)4.22	(-)3.26

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

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

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

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

Depressions on peat substrates of the Rhynchosporion (7150)

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

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

The Area trend assessment is based on the variation on Active Raised Bog and sub-marginal ecotope within Degraded Raised Bog in the reporting period. The area of Active Raised Bog has remained unchanged in the reporting period, but there has been a 7.0ha decrease in sub-marginal ecotope. As result habitat Area is given a **Decreasing** 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 Inadequate-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 Inadequate-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 Monivea Bog is assessed as Unfavourable Bad-Declining (see table 8.5).

Table 8.4 Habitats favourable reference values

Habitat	Area Assessment			Structure & Functions Assessment		
	FRV Target (ha) ¹	2012 value (ha) ²	% below target	FRV 2012 Target (ha) ³	2012 value (ha) ⁴	% below target
7110	109.88	7.03	93.60	3.52	3.05	13.35

	FRV Target (ha) ⁵	2012 value (ha) ⁶	% above target	FRV 2012 Target (ha) ⁷	2012 value (ha) ⁸	% below target
7120	22.29	125.14	461.42	31.29	21.02	32.81

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

² 2012 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 2012 central ecotope and active flush area.

⁵ Current high bog area minus 7110 area FRV.

⁶ 2012 Degraded Raised Bog area.

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

⁸ Current marginal and face bank ecotopes area.

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

- **Active Raised Bog is assessed as being Unfavourable Bad–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-Stable	Unfavourable Inadequate-Stable	Unfavourable Bad-Declining	Unfavourable Bad-Declining
7120	Unfavourable Bad-Decreasing	Favourable-Declining	Unfavourable Bad-Declining	Unfavourable Bad-Declining
7150	Unfavourable Bad-Decreasing	Unfavourable Inadequate-Stable	Unfavourable Bad-Declining	Unfavourable Bad-Declining

Conclusions

Summary of impacting activities

- Peat cutting still continues at the site and has taken place at 97 locations in the 2005-2010 reporting period. 4.2ha of high bog have been lost in this period due to peat cutting and this activity is considered to be the reason for the decline in Degraded Raised Bog that is particularly evident in the north-eastern lobe of the high bog where 67 of the turf plots were located. 78 plots were recorded as being actively cut in 2012 and 49 in 2013.
- 1.9km of drains on the high bog remain functional and a further 2.4km are classed as reduced functional.
- Cutover drainage (peripheral drainage) associated with either currently active or no longer active peat cutting continue to impact on the high bog habitats. An extensive network of drains is found on the cutover along the entire eastern length and part of the northern length of high bog. These drains are likely to be continually maintained as long as peat cutting continues.

- A severe fire event damaged 15.68ha (11.86%) the high bog in the reporting period.

Changes in active peat forming areas

- There has been almost no change in the total area (increase of 0.01ha) of Active Raised Bog at Monivea Bog in the 2005 to 2012 period. However, the mapped distribution of habitats has changed in several ways; all such changes are attributed to the more comprehensive mapping exercise employed in the current survey or to vegetation re-interpretation.
- The increase of 0.01ha is the result of the infilling of one of the small open water lakes recorded in 2005. This area is now mapped as active flush as the lake has become largely infilled with *Sphagnum*. Ongoing changes on this section of the high bog are almost certainly due to regional changes in water pressure under the bog, due to marginal drainage. Subsidence on the high bog could occasionally lead to localised rewetting of the surface and the formation of small depressions. This type of depressions associated with subsidence has been seen to occur locally at Clara Bog. These localised depressions were associated with increased water losses through the base of the bog due to drainage and/or turf cutting in marginal areas which drain more permeable layers under the bog. The creation of such enclosed hollows will usually result in steeper slopes and increased drying out in the surrounding high bog area. Such changes, although they may in some cases locally favour Active Raised Bog, occur at the expense of irreversible long terms changes in the topography/hydrology of the bog.
- Two small new sub-central areas (**Sc8** and **Sc9**) have been described at the site and one small active flush (**V**), but these are all considered to be the result of more comprehensive field mapping rather than actual changes.
- Two small sub-central areas recorded in 2005 (**Sc5** and **Sc7**) are no longer present on the high bog. However these areas corresponded with only a single isolated sub-central ecotope dot in 2005. These isolated dots were again recorded in 2012, but the areas were considered too small to map. Thus, these losses are not considered a real change but to be a result of more comprehensive surveying in 2012 which resulted in more accurate mapping.
- There have also been changes in the boundaries of the central ecotope (**C1** and **C2**) with **C1** mapped as significantly larger in 2012 than in 2005. Again, however, the area into which **C1** has been expanded into was not surveyed in 2005 and thus this is unlikely to represent a real change either. Similarly, there have been changes to the boundaries of the sub-central ecotope with **Sc1** and **Sc4** mapped as slightly larger in 2012 and **Sc2**, **Sc3** and **Sc6** mapped

as slightly smaller. These mapping changes can also be attributed to the more intensive mapping effort involved in the 2012 survey.

- The active part of Flush **X** is also mapped as slightly smaller and this is attributed to the re-interpretation of vegetation as part of its former extent is now deemed to be part of **Sc1**.
- Part of the apparent losses in **Sc3** are also likely to be due to vegetation re-interpretation as Complex 3/10 described from here in 2005 was described as forming a mosaic with the sub-marginal complex 3/9 in this area and as having a *Sphagnum* cover of 30-40%, but was mapped entirely as sub-central ecotope.

Other changes

- The increase in marginal ecotope during the reporting period was almost exclusively recorded in the north-eastern lobe of the high bog (east of flush X and particularly east of drain bM). This is the area where peat cutting is most intensive and thus high bog drying out processes associated with peat cutting appears to be affecting the high bog in this area.
- 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, W, X, Y and Z have been slightly modified, also as a result of more comprehensive surveying while a small inactive flush U has been newly described.

Quadrats analysis

- **Qc1:** Greater cover of pools and *Sphagnum* cover in 2012; higher cover of *S. austinii* and *S. papillosum*; lower cover of *S. cuspidatum*; higher cover of *Calluna vulgaris* and *Cladonia portentosa*; lower cover of *Trichophorum germanicum* and *Rhynchospora alba*. All differences likely due to minor difference in quadrat location.
- **Qsc1:** Greater *Sphagnum* cover in 2012; higher cover of *S. papillosum* and *S. magellanicum*; lower cover of *S. austinii*; higher cover of *Trichophorum germanicum* and *Narthecium ossifragum*; lower cover of *Calluna vulgaris* and *Rhynchospora alba*. All differences likely due to minor difference in quadrat location.
- **Qsc2:** Greater cover of pools in 2012, but lower *Sphagnum* cover; higher cover of *S. austinii* and *S. subnitens*; lower cover of *S. papillosum* and *S. magellanicum*; significantly higher cover of *Narthecium ossifragum*; lower cover of *Trichophorum germanicum* and *Rhynchospora alba*.

The increase in the cover of *Narthecium ossifragum* as well as some of the other changes is likely to have been caused by the fire which affected this area in 2010. However, some of the differences are likely to be due to minor difference in quadrat location.

- **Qsc3:** Lower cover of pools in 2012, but greater *Sphagnum* cover; higher cover of *S. magellanicum*; lower cover of *S. austinii* and *S. cuspidatum*; higher cover of *Calluna vulgaris*; lower cover of *Narthecium ossifragum*. All differences likely due to minor difference in quadrat location.

Restoration works

- Only very limited restoration works have been undertaken to date at Monivea Bog and have been restricted to a 9.3ha area to the north-west of the high bog that was formerly a *Pinus contorta* plantation, but is now part of the Coillte Life project (LIFE09 NAT/IE/000222) to restore raised bogs. However, although positive measures have been undertaken (and are scheduled to be carried out periodically until 2015) including the removal of the plantation in 2006, the removal of naturally regenerating conifers (annually from 2012 to 2015) and the installation of peat dams (2012 and 2013) as well as hydrological and vegetation monitoring, the restoration area is bounded to the south by a deep drain, which cannot at this time be blocked (due to the land to the south of the drain being in private ownership), and thus the restoration area would currently appear to be a separate hydrological unit to the rest of the SAC at Monivea Bog including the high bog (Conaghan, in prep.) meaning that any influence on the high bog hydrology and thus on the high bog habitats is likely to be negligible.
- NPWS has engaged in negotiation with landowners in relation to the cessation of peat cutting at the site. Despite negotiations peat cutting continues at Monivea Bog.

Summary of conservation status

- **Active Raised Bog** has been given an **Unfavourable Bad–Declining** conservation status at Monivea Bog. Habitat Area and quality (S&Fs) have remained unchanged in the reporting period. Both of these assessment criteria are currently substantially below the FRVs. Future Prospects are considered Unfavourable Bad–Declining as impacting activities (peat cutting and drainage) continue to threaten the habitat.
- **Degraded Raised Bog** has been given an **Unfavourable Bad–Declining** conservation status at Monivea Bog. Habitat Area has decreased (by 4.2ha) due to peat cutting. Habitat Area is substantially above the FRV. Habitat's S&Fs have also declined due to peat cutting with an

increase in marginal ecotope recorded in the north-eastern lobe of the site. 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 Monivea Bog. Habitat Area is considered to have decreased and quality (S&Fs) remained stable in the reporting period. Future Prospects are also considered Unfavourable Bad-Declining as a result of threatening impacting activities.

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

Recommendations

- **Cessation of peat cutting.**
- **Restoration works** including the blocking of high bog functional and reduced-functional drains. However, the potential for improvement here is somewhat limited, as there are relatively few drains on the high bog.
- **The blocking of cutover drains** is also to be recommended. There is potential for the restoration of cutover around the entire site, but particularly along the north-west, north, north-east, east, south-east and south, as the cutover is more extensive there. This may be particularly important as reaching the ARB target on the high bog alone may not be achievable.
- **Further hydrological and topographical studies** to ascertain the capacity of the high bog to support Active Raised Bog and thus estimate a more accurate favourable reference value. Hydrological studies should also aim to understand the impacts on the bog arising from regional drainage works, particularly on the Killaclogher River, which runs close to much of the eastern extent of the cutover at Monivea Bog, as well as to the northwest of the high bog where ongoing changes have been noted since the 1900's.
- **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)

COMPLEX 14

- **Location:** this complex characterises the central area of C2
- **Ground:** quaking
- **Physical indicators:** absent
- **Calluna height:** 21-40cm
- **Cladonia cover:** <4%
- **Macro-topography:** depression
- **Pools:** interconnecting pools 51-75%
- **Sphagnum cover:** 91-100%
- **Narthecium cover:** 5-10%
- **Micro- topography:** occasional high hummocks, low hummocks, lawns and pools
- **Tussocks:** absent
- **Degradation or regeneration evidence:** absent
- **Species cover:** *Calluna vulgaris* (11-25%), *Eriophorum vaginatum* (5-10%), *Narthecium ossifragum* (5-10%), *Rhynchospora alba* (11-25%), *R. fusca* (<4%), *Trichophorum germanicum* (<4%), *Sphagnum capillifolium* (11-25%), *S. cuspidatum* (33-50%), *S. papillosum* (33-50%), *S. magellanicum* (<4%), *S. tenellum* (<4%), *Aulacomnium palustre* (<4%), *Polytrichum strictum* (<4%), *Cladonia portentosa* (<4%).
- **Additional comments:** Newly mapped area of C2 due to increased mapping detail. *Sphagnum* and pool cover very high, especially in centre of area. Grades to active flush to north and 9/7/10 sub-central to west and boundary not always clear. *Rhynchospora fusca* abundant in one pool in the south of the area at the boundary with Sc1.

COMPLEX 15

- **Location:** this complex characterises C1
- **Ground:** quaking
- **Physical indicators:** absent
- **Calluna height:** 11-20cm

- **Cladonia cover:** <4% (4-10% in places)
- **Macro-topography:** depression
- **Pools:** 26-33%
- **Sphagnum cover:** 76-90%
- **Narthecium cover:** <4% (4-10% in places)
- **Micro- topography:** High and low hummocks/hollows, lawns and pools
- **Tussocks:** absent
- **Degradation or regeneration evidence:** absent
- **Species cover:** *Calluna vulgaris* (11-25%), *Erica tetralix* (<4%), *Eriophorum vaginatum* (<4%), *E. angustifolium* (<4%), *Narthecium ossifragum* (<4%), *Rhynchospora alba* (4-10%; 11-25% in places), *Trichophorum germanicum* (<4%), *Menyanthes trifoliata* (<4%), *Drosera anglica* (<4%), *Andromeda polifolia* (<4%), *Aulacomnium palustre* (<4%), *Vaccinium oxycoccos* (<4%), *Sphagnum capillifolium* (H); 4-10%), *S. austinii* (H; <4%; 4-10% in places), *S. papillosum* (H & L); 4-10%), *S. magellanicum* (L; 11-25%; 26-33% in places), *S. denticulatum* (P; <4%), *S. cuspidatum* (P; 26-33%).
- **Additional comments:** Grades into the sub-central complex 4/10.

Quadrat Qc1 was recorded within this complex.

COMPLEX 10/15

- **Location:** this complex is found along the northern sections of C2
- **Ground:** quaking
- **Physical indicators:** absent
- **Calluna height:** 21-40cm
- **Cladonia cover:** <4%
- **Macro-topography:** depression
- **Pools:** interconnecting pools 5-10%
- **Sphagnum cover:** 91-100%
- **Narthecium cover:** 11-25%
- **Micro- topography:** occasional high hummocks, low hummocks, lawns and flats
- **Tussocks:** *Trichophorum germanicum* 5-10%
- **Degradation or regeneration evidence:** absent
- **Species cover:** *Calluna vulgaris* (11-25%), *Eriophorum vaginatum* (<4%), *E. angustifolium* (<4%), *Narthecium ossifragum* (11-25%), *Rhynchospora alba* (<4%), *Trichophorum germanicum* (5-10%), *Sphagnum capillifolium* (11-25%), *S. cuspidatum* (5-10%), *S. papillosum* (25-33%), *S. magellanicum* (11-25%), *S. austinii* (<4%), *S. fuscum* (<4%), *S. tenellum* (<4%), *Cladonia portentosa* (<4%).

- **Additional comments:** Newly mapped area of C2 due to increased mapping detail. Very high *Sphagnum* cover with few pools. Grades to sub-central complex 9/7/10 in the west and to active flush in the north.

Sub-Central Ecotope Complexes

COMPLEX 4/10

- **Location:** this complex characterises **Sc2** and was found within eastern section of **Sc1**
- **Ground:** very soft
- **Physical indicators:** bare peat absent
- **Calluna height:** 21-40cm
- **Cladonia cover:** 5-10%
- **Macro-topography:** depression
- **Pools:** occasional <4%
- **Sphagnum cover:** 51-75%
- **Narthecium cover:** 5-10%
- **Micro- topography:** occasional high hummocks, low hummocks, pools, lawns and flats
- **Tussocks:** *Trichophorum germanicum* <4%
- **Degradation or regeneration evidence:** absent
- **Species cover:** *Calluna vulgaris* (11-25%), *Erica tetralix* (5-10%), *Eriophorum vaginatum* (<4%), *Rhynchospora alba* (11-25%), *Trichophorum germanicum* (<4%), *Carex panicea* (<4%), *Sphagnum capillifolium* (25-33%), *S. cuspidatum* (5-10%), *S. papillosum* (25-33%), *S. austinii* (<4%), *S. fuscum* (<4%), *S. tenellum* (<4%), *Cladonia portentosa* (11-25%).
- **Additional comments:** Grades into sub-marginal complex 9/7/2 around edges and some areas mapped as 4/10 sub-central are transitional areas. *Carex panicea* locally increases to 5-10%. This complex becomes very wet with the quality bordering on central ecotope in the south-western extent of **Sc2**.

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

COMPLEX 9/7/10

- **Location:** this complex is found scattered within **Sc1**
- **Ground:** very soft to quaking
- **Physical indicators:** bare peat absent
- **Calluna height:** 21-40cm

- **Cladonia cover:** 5-10%
- **Macro-topography:** flat
- **Pools:** occasional <4%
- **Sphagnum cover:** 76-90%
- **Narthecium cover:** absent
- **Micro- topography:** high hummocks, low hummocks, lawns and hollows
- **Tussocks:** absent
- **Degradation or regeneration evidence:** absent
- **Species cover:** *Calluna vulgaris* (51-75%), *Eriophorum vaginatum* (5-10%), *E. angustifolium* (<4%), *Empetrum nigrum* (<4%), *Molinia caerulea* (<4%), *Carex panicea* (<4%), *Vaccinium oxycoccos* (<4%), *Sphagnum capillifolium* (51-75%), *S. cuspidatum* (5-10%), *S. papillosum* (5-10%), *S. austinii* (5-10%), *S. fuscum* (<4%), *S. tenellum* (<4%), *S. magellanicum* (<4%), *Hypnum jutlandicum* (<4%), *Aulacomnium palustre* (<4%), *Cladonia portentosa* (5-10%).
- **Additional comments:** This complex dominates **Sc1** to the north-west of **C2**, which is where the description was taken. Some flush species (e.g. *Molinia caerulea* and *Aulacomnium palustre*) are present and this area grades into active flush to the east. *Sphagnum austinii* cover high and hummocks frequent throughout.
 Quadrat **Qsc3** was recorded within this complex.

COMPLEX 9/10

- **Location:** this complex is found within the southwest section of **Sc1**
- **Ground:** very soft
- **Physical indicators:** bare peat absent
- **Calluna height:** 21-40cm
- **Cladonia cover:** 5-10%
- **Macro-topography:** flat
- **Pools:** occasional <4%
- **Sphagnum cover:** 51-75%
- **Narthecium cover:** <4%
- **Micro- topography:** low hummocks, pools and lawns
- **Tussocks:** *Trichophorum germanicum* <4%; *Eriophorum vaginatum* (25-30%),
- **Degradation or regeneration evidence:** absent
- **Species cover:** *Calluna vulgaris* (25-33%), *Eriophorum vaginatum* (25-30%), *E. angustifolium* (<4%), *Empetrum nigrum* (<4%), *Trichophorum germanicum* (<4%), *Carex panicea* (<4%), *Sphagnum*

capillifolium (25-33%), *S. cuspidatum* (11-25%), *S. papillosum* (11-25%), *S. austinii* (<4%), *S. tenellum* (<4%), *Polytrichum strictum* (<4%), *Aulacomnium palustre* (<4%), *Cladonia portentosa* (5-10%).

- **Additional comments:** Grades into active flush and some flush species occasional in transitional areas.

COMPLEX 9A/10

- **Location:** this complex dominates Sc6
- **Ground:** very soft
- **Physical indicators:** absent
- **Calluna height:** 11-20cm
- **Cladonia cover:** 4-10%
- **Macro-topography:** depression
- **Pools:** 4-10%
- **Sphagnum cover:** 51-75%
- **Narthecium cover:** 4-10%
- **Micro- topography:** Poorly developed hummocks/hollows, flats, lawns and pools.
- **Tussocks:** *Trichophorum germanicum* 4-10% (<4% in places)
- **Degradation or regeneration evidence:** absent
- **Species cover:** *Calluna vulgaris* (4-10%), *Erica tetralix* (4-10%), *Eriophorum angustifolium* (11-25%), *E. vaginatum* (4-10%), *Carex panicea* (4-10%; 11-25% in places%), *Andromeda polifolia* (<4%), *Vaccinium oxycoccos* (<4%), *Sphagnum capillifolium* (H; 11-25%), *S. papillosum* (H & L; 26-33%), *S. magellanicum* (H & L; 4-10%), *S. cuspidatum* (P; 4-10%).
- **Additional comments:** This complex occurs in a depression where there appears to be some ponding of water.

COMPLEX 6/10

- **Location:** this complex dominates Sc4
- **Ground:** very soft (quaking in places)
- **Physical indicators:** bare peat 4-10% (burnt prior to AP of 2010)
- **Calluna height:** 0-10cm
- **Cladonia cover:** absent
- **Macro-topography:** flat
- **Pools:** 4-10% (11-25% in places)

- **Sphagnum cover:** 51-75% (34-50% in places)
- **Narthecium cover:** 34-50%
- **Micro- topography:** Low hummocks/hollows and pools.
- **Tussocks:** absent
- **Degradation or regeneration evidence:** absent
- **Species cover:** *Calluna vulgaris* (4-10%), *Erica tetralix* (<4%), *Eriophorum angustifolium* (<4%), *E. vaginatum* (<4%; 4-10% in places), *Carex panicea* (<4%; 4-10% in places), *Andromeda polifolia* (<4%), *Rhynchospora alba* (<4%; 4-10% in places), *Sphagnum capillifolium* (H; 4-10%; 11-25% in places), *S. papillosum* (H & L; 26-33%), *S. austinii* (H; <4%; 4-10% in places), *S. fuscum* (H; <4%), *S. subnitens* (H; <4%), *S. magellanicum* (H & L; <4%), *S. cuspidatum* (P; 4-10%; <4% in places).
- **Additional comments:** None.

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

COMPLEX 3/10

- **Location:** this complex dominates **Sc3;Sc8** and **Sc9**, and was also found within **Sc1**
- **Ground:** soft to very soft
- **Physical indicators:** absent but burnt (prior to 2010 AP) in the west of this sub-central area (bare peat 4-10% 11-25% in places)
- **Calluna height:** 11-25cm (0-10cm in the west)
- **Cladonia cover:** 4-10% (absent in the west)
- **Macro-topography:** gentle slope
- **Pools:** 4-10%
- **Sphagnum cover:** 51-75%
- **Narthecium cover:** 4-10%
- **Micro- topography:** Low hummocks/hollows, lawns and pools.
- **Tussocks:** *Trichophorum germanicum* <4% (4-10% in places)
- **Degradation or regeneration evidence:** absent
- **Species cover:** *Calluna vulgaris* (<4%; 4-10% in places), *Erica tetralix* (4-10%; 11-25% in places), *Eriophorum angustifolium* (<4%; 4-10% in places), *E. vaginatum* (4-10%), *Carex panicea* (11-25%), *Sphagnum capillifolium* (H; 11-25%), *S. papillosum* (H & L; 11-25%), *S. austinii* (H; <4%; 4-10% in places), *S. fuscum* (H; <4%), *S. tenellum* (H; <4%), *S. cuspidatum* (P; <4%).
- **Additional comments:** The description above was taken within **Sc8**. This complex is also found in two small patches to the east of **C1** in **Sc3** and **Sc9**. The *Sphagnum* cover is again dominated by *S. papillosum* (26-33%) along with *S. capillifolium* (11-25%) with lower cover values of *S.*

cuspidatum and *S. austinii* (both <4%; 4-10% in places). In both of these two areas this complex was recorded adjacent to small areas (ca. 7m x 5m) dominated by *Molinia caerulea* and also adjacent to large *Polytrichum strictum* hummocks with *Empetrum nigrum*, *Vaccinium oxycoccos* and *Aulacomnium palustre*.

This complex often grades into the sub-marginal complex 9/7/2.

Active flushes

FLUSH V

- **Location:** west of flush Z
- **Ground:** very soft
- **Physical indicators:** absent
- **Calluna height:** 21-30cm
- **Cladonia cover:** <4%
- **Macro-topography:** depression
- **Pools:** <4%
- **Sphagnum cover:** 51-75%
- **Narthecium cover:** <4% (4-10% in places)
- **Micro- topography:** Hummocks/hollows
- **Tussocks:** absent
- **Degradation or regeneration evidence:** absent
- **Species cover:** *Molinia caerulea* (4-10%), *Calluna vulgaris* (11-25%), *Erica tetralix* (4-10%), *Eriophorum angustifolium* (<4%), *E. vaginatum* (4-10%), *Carex panicea* (4-10%), *Rhynchospora alba* (<4%), *Andromeda polifolia* (<4%), *Sphagnum capillifolium* (H; 4-10%), *S. papillosum* (H; 11-25%), *S. magellanicum* (L & H; 4-10%; 11-25% in places), *S. tenellum* (H; <4%), *S. cuspidatum* (L, Hl, & P; 11-25%).
- **Additional comments:** This small active flush is easily distinguishable from the surrounding sub-marginal vegetation by the presence of *Molinia caerulea*.

FLUSH X

- **Location:** NW of high bog (active) and running to the south-east (inactive)
- **Ground:** very soft
- **Physical indicators:** absent
- **Calluna height:** 21-30cm

- **Cladonia cover:** <4%
- **Macro-topography:** gentle slope
- **Pools:** absent
- **Sphagnum cover:** 51-75% (76-90% in places)
- **Narthecium cover:** <4%
- **Micro- topography:** Hummocks/hollows
- **Tussocks:** *Molinia caerulea* (11-25%)
- **Degradation or regeneration evidence:** absent
- **Species cover:** *Molinia caerulea* (11-25%; 4-10% in places), *Calluna vulgaris* (26-33%), *Erica tetralix* (<4%), *Eriophorum vaginatum* (11-25%), *E. angustifolium* (<4%), *Carex panicea* (<4%), *Andromeda polifolia* (<4%), *Empetrum nigrum* (<4%), *Vaccinium oxycoccos* (<4%), *Aulacomnium palustre* (4-10%), *Polytrichum strictum* (<4%), *Pleurozium schreberi* (<4%), *Sphagnum capillifolium* (H; 11-25%), *S. tenellum* (H; <4%), *S. papillosum* (H; 11-25%), *S. magellanicum* (L & H; 4-10%), *S. fallax* (H; 4-10%), *S. cuspidatum* (L, H, & P; 4-10%).
- **Additional comments:** Some parts of flush X were incorrectly mapped as inactive in 2005. Hummocks of *S. austinii* become frequent where the flush grades into complex 9/710.

Degraded Raised Bog (7120)

COMPLEX 9/7/2

- **Location:** this community complex was found along the northern section of the high bog and to the south of C1
- **Ground:** soft to very soft (wet)
- **Physical indicators:** absent
- **Calluna height:** 21-30cm
- **Cladonia cover:** 11-25%
- **Macro-topography:** flat
- **Pools:** absent
- **Sphagnum cover:** 26-33% (34-50% in places)
- **Narthecium cover:** <4% (4-10% in places)
- **Micro- topography:** Hummocks/hollows
- **Tussocks:** *Trichophorum germanicum* (4-10%)
- **Degradation or regeneration evidence:** absent

- **Species cover:** *Calluna vulgaris* (26-33%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (4-10%; 11-25% in places), *E. angustifolium* (<4%), *Narthecium ossifragum* (<4%), *Carex panicea* (4-10%), *Vaccinium oxycoccos* (<4%), *Andromeda polifolia* (<4%), *Empetrum nigrum* (<4%), *Sphagnum capillifolium* (H; 11-25%; 26-33% in places), *S. papillosum* (H; 4-10%), *S. tenellum* (H; <4%), *S. austinii* (H; <4%), *S. cuspidatum* (Hl; <4%), *Cladonia uncialis* (<4%).
- **Additional comments:** This complex grades into sub-central ecotope in places and its presence may be related to water flow patterns. The description was taken to the south of C1.

COMPLEX 9/7/6

- **Location:** this community complex was recorded across the entire sub-marginal ecotope except the NW section of high bog.
- **Ground:** soft
- **Physical indicators:** largely absent but *Campylopus introflexus* <4%
- **Calluna height:** 21-30cm
- **Cladonia cover:** <4%
- **Macro-topography:** gentle slope
- **Pools:** <4%
- **Sphagnum cover:** 26-33%
- **Narthecium cover:** 11-25% (4-10% in places)
- **Micro- topography:** Hummocks/hollows
- **Tussocks:** *Trichophorum germanicum* (<4%)
- **Degradation or regeneration evidence:** absent
- **Species cover:** *Calluna vulgaris* (26-33%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (4-10%), *E. angustifolium* (<4%), *Narthecium ossifragum* (11-25%), *Rhynchospora alba* (<4%), *Carex panicea* (<4%), *Sphagnum capillifolium* (H; 11-25%), *S. papillosum* (H; 11-25%), *S. tenellum* (H; <4%), *S. austinii* (H; <4%), *S. cuspidatum* (Hl & P; <4%; 4-10% in places), *Racomitrium lanuginosum* (<4%), *Cladonia uncialis* (<4%).
- **Additional comments:** The description above was taken between flush X and Y. Complex 9/7/6 becomes 9/7/3 where *Carex panicea* replaces *Narthecium ossifragum* as one of the co-dominants. Generally the *Sphagnum* cover is slightly lower in these areas (11-25%). *Huperzia selago* is present within this complex in the south of the site. There are also areas where the cover of *Cladonia portentosa* approaches or exceeds 50% and these are labelled 9/7/3 + Cl. Where pools occur at ca. 10% cover or more, the complex is labelled 9/7/6 + P.

COMPLEX 6/3

- **Location:** this community complex is mostly found along eastern section of high bog
- **Ground:** soft to very soft
- **Physical indicators:** absent
- **Calluna height:** 11-20cm
- **Cladonia cover:** 4-10%
- **Macro-topography:** flat
- **Pools:** absent
- **Sphagnum cover:** 26-33% (34-50% in places but 11-25% in others)
- **Narthecium cover:** 11-25%
- **Micro- topography:** Poorly developed hummocks/hollows and flats
- **Tussocks:** *Trichophorum germanicum* (4-10%)
- **Degradation or regeneration evidence:** absent
- **Species cover:** *Calluna vulgaris* (4-10%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (<4%), *E. angustifolium* (<4% many), *Narthecium ossifragum* (11-25%), *Rhynchospora alba* (<4%), *Carex panicea* (4-10%; 11-25% in places), *Andromeda polifolia* (<4%), *Sphagnum capillifolium* (H; 11-25%), *S. papillosum* (H; <4%), *S. tenellum* (H; <4%), *S. austinii* (H; <4%), *S. fuscum* (H; <4%), *S. subnitens* (H; <4%), *S. magellanicum* (H; <4%), *S. cuspidatum* (H; <4%), *Racomitrium lanuginosum* (<4%), *Cladonia uncialis* (<4%).
- **Additional comments:** this complex occurs with *Myrica gale* in places and in these areas is termed 6/3 + My.

COMPLEX 6/3/4

- **Location:** this community complex was recorded to the north of Sc4
- **Ground:** soft
- **Physical indicators:** bare peat (<4%)
- **Calluna height:** 21-40cm
- **Cladonia cover:** absent
- **Macro-topography:** flat
- **Pools:** absent
- **Sphagnum cover:** 11-25% (locally 25-33%)
- **Narthecium cover:** 11-25%
- **Micro- topography:** occasional low hummocks
- **Tussocks:** *Eriophorum vaginatum* (<4%)

- **Degradation or regeneration evidence:** recently burnt
- **Species cover:** *Calluna vulgaris* (5-10%), *Eriophorum vaginatum* (<4%), *Erica tetralix* (<4%), *Narthecium ossifragum* (11-25%), *Rhynchospora alba* (5-10%), *Carex panicea* (5-10%), *Sphagnum capillifolium* (5-10%), *S. tenellum* (<4%), *S. papillosum* (5-10%).

Additional comments: Similar to 9/7/4 sub-marginal complex but recently burnt and *Calluna vulgaris* and *Eriophorum vaginatum* cover reduced. Localised areas very wet with higher *Sphagnum* cover (25-33%).

COMPLEX 6/3(RB)

- **Location:** this community complex was recorded along eastern section of high bog
- **Ground:** soft
- **Physical indicators:** bare peat 4-10% (11-25% in places); burnt prior to AP of 2010
- ***Calluna* height:** 0-10cm
- ***Cladonia* cover:** absent
- **Macro-topography:** flat/gentle slope
- **Pools:** absent
- ***Sphagnum* cover:** 11-25%
- ***Narthecium* cover:** 34-50%
- **Micro- topography:** Poorly developed hummocks/hollows and flats
- **Tussocks:** *Trichophorum germanicum* <4% (4-10% in places)
- **Degradation or regeneration evidence:** absent
- **Species cover:** *Calluna vulgaris* (11-25%), *Erica tetralix* (<4%), *Eriophorum vaginatum* (<4%), *E. angustifolium* (<4%), *Narthecium ossifragum* (34-50%), *Rhynchospora alba* (<4%), *Carex panicea* (11-25%; 26-33% in places), *Sphagnum capillifolium* (H; 11-25%), *S. papillosum* (H; 4-10%), *S. tenellum* (H; <4%), *S. austinii* (H; <4%), *S. cuspidatum* (Hl; <4%).
- **Additional comments:** none.

COMPLEX 6/3/4(RB)

- **Location:**
- **Ground:** soft
- **Physical indicators:** bare peat 4-10; burnt prior to AP of 2010
- ***Calluna* height:** 0-10cm
- ***Cladonia* cover:** absent
- **Macro-topography:** flat

- **Pools:** absent
- **Sphagnum cover:** 11-25% (26-33% in places)
- **Narthecium cover:** 26-33%
- **Micro- topography:** Poorly developed hummocks/hollows and flats
- **Tussocks:** *Trichophorum germanicum* <4%
- **Degradation or regeneration evidence:** absent
- **Species cover:** *Calluna vulgaris* (4-10%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (<4%; 4-10% in places), *E. angustifolium* (<4%), *Narthecium ossifragum* (34-50%), *Rhynchospora alba* (4-10%), *Carex panicea* (4-10%; 11-25% in places), *Sphagnum capillifolium* (H; 4-10%; 11-25% in places), *S. papillosum* (H; 11-25%), *S. tenellum* (H; <4%), *S. subnitens* (H; <4%), *S. cuspidatum* (H; <4%).
- **Additional comments:** none.

Marginal Ecotope Complexes

COMPLEX 6/7/3

- **Location:** this is the most widespread marginal ecotope community complex at the site and was found along high bog margin
- **Ground:** firm
- **Physical indicators:** bare peat (4-10%)
- **Calluna height:** 21-30cm
- **Cladonia cover:** 4-10%
- **Macro-topography:** steep slope
- **Pools:** absent
- **Sphagnum cover:** 4-10%
- **Narthecium cover:** 11-25% (higher in places)
- **Micro- topography:** low hummocks/*Narthecium ossifragum* flats/ hollows
- **Tussocks:** *Trichophorum germanicum* (<4%; 4-10% in places)
- **Degradation or regeneration evidence:** absent
- **Species cover:** *Calluna vulgaris* (34-50%), *Eriophorum vaginatum* (<4%), *Narthecium ossifragum* (11-25%), *Trichophorum germanicum* (<4%), *Carex panicea* (4-10%), *Sphagnum capillifolium* (H; 4-10%), *S. tenellum* (H; <4%), *S. austinii* (H; <4%), *S. fuscum* (H; <4%).
- **Additional comments:** where this complex is present immediately to the south of flush Y, *Narthecium ossifragum* (11-25%) occurs at 34-50% cover. Parts of this complex were burned prior to the AP of 2010.

COMPLEX 3/7/6

- **Location:** north-west of the site
- **Ground:** firm
- **Physical indicators:** bare peat (26-33%). Burnt prior to the AP of 2010
- **Calluna height:** 0-10cm
- **Cladonia cover:** absent
- **Macro-topography:** steep slope
- **Pools:** absent
- **Sphagnum cover:** 4-10%
- **Narthecium cover:** 11-25% (4-10% in places)
- **Micro- topography:** flats
- **Tussocks:** *Trichophorum germanicum* (<4%)
- **Degradation or regeneration evidence:** absent
- **Species cover:** *Calluna vulgaris* (26-33%), *Narthecium ossifragum* (4-10%), *Trichophorum germanicum* (<4%), *Carex panicea* (11-25%), *Sphagnum capillifolium* (H; 4-10%), *S. tenellum* (H; <4%).
- **Additional comments:** where this complex is present immediately to the south of flush Y, *Narthecium ossifragum* (11-25%) occurs at 34-50% cover. Parts of this complex were burned prior to the AP of 2010.

Inactive flushes

FLUSH U

- **Location:** south section of high bog
- **Ground:** soft
- **Physical indicators:** absent
- **Calluna height:** 11-20cm
- **Cladonia cover:** 4-10%
- **Macro-topography:** gentle slope
- **Pools:** absent
- **Sphagnum cover:** 11-25%
- **Narthecium cover:** <4%
- **Micro- topography:** *Molinia* tussocks
- **Tussocks:** *Molinia caerulea* 51-75%

- **Degradation or regeneration evidence:** absent
- **Species cover:** *Molinia caerulea* (51-75%), *Calluna vulgaris* (<4%), *Erica tetralix* (4-10%), *Carex panicea* (<4%), *Eriophorum angustifolium* (<4%), *E. vaginatum* (<4%), *Sphagnum capillifolium* (H; 11-25%), *S. papillosum* (H; <4%).
- **Additional comments:** None.

FLUSH X

- **Location:** northwest section of high bog
- **Ground:** very soft
- **Physical indicators:** absent
- **Calluna height:** 21-30cm
- **Cladonia cover:** <4%
- **Macro-topography:** gentle slope
- **Pools:** absent
- **Sphagnum cover:** 26-33%
- **Narthecium cover:** <4%
- **Micro- topography:** Hummocks/hollows
- **Tussocks:** *Molinia caerulea* (26-33%)
- **Degradation or regeneration evidence:** absent
- **Species cover:** *Molinia caerulea* (26-33%), *Calluna vulgaris* (26-33%), *Erica tetralix* (<4%), *Eriophorum vaginatum* (4-10%), *Potentilla erecta* (<4%), *Andromeda polifolia* (<4%), *Empetrum nigrum* (4-10%), *Pleurozium schreberi* (26-33%), *Juncus effusus* (<4%), *Sphagnum capillifolium* (H; 11-25%), *S. tenellum* (H; <4%), *S. papillosum* (H; <4%), *S. cuspidatum* (Hl; <4%).
- **Additional comments:** This description was taken immediately north of the area of active flush. Further north again there are a number of *Pinus sylvestris* (up to 4m in height).

This is a large linear flush, which extends from the NW corner SE to the centre of the site where it exits the bog in an area of former peat cutting. At the NW end it consists of an open water lake area (not shown on the 1910 6" sheet).

FLUSH W

- **Location:** northeast section of high bog
- **Ground:** firm to soft
- **Physical indicators:** absent
- **Calluna height:** 21-30cm

- **Cladonia cover:** 4-10%
- **Macro-topography:** gentle to steep slope
- **Pools:** absent
- **Sphagnum cover:** 26-33%
- **Narthecium cover:** 4-10%
- **Micro- topography:** Not Applicable
- **Tussocks:** None
- **Degradation or regeneration evidence:** absent
- **Species cover:** *Molinia caerulea* (76-90%), *Calluna vulgaris* (4-10%), *Erica tetralix* (4-10%), *Carex panicea* (<4%), *Eriophorum vaginatum* (<4%), *Potentilla erecta* (<4%), *Andromeda polifolia* (<4%), *Polygala serpyllifolia* (<4%), *Myrica gale* (<4%), *Empetrum nigrum* (<4%), *Sphagnum capillifolium* (H; 11-25%), *S. papillosum* (H; <4%), *S. austinii* (H; <4%), *S. tenellum* (H; <4%), *S. cuspidatum* (H; <4%).
- **Additional comments:** There are some 'clearings' within this flush where *Molinia caerulea* does not dominate. These areas tend to have a higher *Sphagnum* cover (34-50%) dominated almost entirely by *S. capillifolium*. *Carex panicea* (26-33%), *Erica tetralix* (11-25%), *Calluna vulgaris* (4-10%) and *Narthecium ossifragum* dominate in these areas. There are also some scattered *Pinus sylvestris* (<2m) saplings within this flush.

FLUSH Y

- **Location:** middle section of high bog
- **Ground:** soft
- **Physical indicators:** absent
- **Calluna height:** 11-20cm
- **Cladonia cover:** 11-25%
- **Macro-topography:** gentle slope
- **Pools:** absent
- **Sphagnum cover:** 11-25%
- **Narthecium cover:** 4-10%
- **Micro- topography:** *Molinia* tussocks
- **Tussocks:** *Molinia caerulea* 76-90%
- **Degradation or regeneration evidence:** absent

- **Species cover:** *Molinia caerulea* (76-90%), *Calluna vulgaris* (4-10%), *Erica tetralix* (4-10%), *Carex panicea* (4-10%), *Eriophorum vaginatum* (<4%), *Andromeda polifolia* (<4%), *Sphagnum capillifolium* (H; 11-25%), *S. papillosum* (H; <4%), *Polytrichum strictum* (<4%).
- **Additional comments:** The central axis of the flush is delineated by a line of robust *Calluna vulgaris*, which is found along with *Betula pubescens* and *Salix* sp. Swallow holes (with running water heard) are also found along this central axis with *Molinia caerulea*, *Rubus fruticosus*, *Pteridium aquilinum*, *Juncus effusus*, *Potentilla erecta*, *Vaccinium myrtillus* and *Dryopteris dilatata*. Either side of the central axis there is a band of *Molinia caerulea* dominated vegetation with *Carex panicea* co-dominating towards the margins of the flush. To the west of the area mapped as flush Y some flush features intermittently persist. These are generally large hummocks of *Polytrichum strictum* supporting species such as *Empetrum nigrum*, *Blechnum spicant*, *Aulacomnium palustre* and *Rubus fruticosus*.

FLUSH Z

- **Location:** southeast section of high bog
- **Ground:** soft
- **Physical indicators:** absent
- **Calluna height:** 41-50cm
- **Cladonia cover:** <4%
- **Macro-topography:** steep slope
- **Pools:** absent
- **Sphagnum cover:** 4-10%
- **Narthecium cover:** <4% (4-10% in places)
- **Micro- topography:** *Molinia* tussocks
- **Tussocks:** *Molinia caerulea* 76-90%
- **Degradation or regeneration evidence:** absent
- **Species cover:** *Calluna vulgaris* (4-10%), *Erica tetralix* (<4%), *Myrica gale* (<4%), *Polygala serpyllifolia* (<4%), *Eriophorum angustifolium* (<4%), *Carex panicea* (<4%), *Leucobryum glaucum* (<4%), *Sphagnum capillifolium* (H; 4-10%), *S. papillosum* (H; <4%), *S. subnitens* (H; <4%), *S. tenellum* (H; <4%).
- **Additional comments:** One 2.5m *Betula pubescens* is also present within this flush.

Face bank Complexes

COMPLEX 1

- **Location:** this complex was found along the bog margin
- **Ground:** firm
- **Physical indicators:** bare peat (4-10%)
- **Calluna height:** 41-50cm
- **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%), *Andromeda polifolia* (<4%), *Sphagnum capillifolium* (H; <4%), *Hypnum jutlandicum* (<4%).
- **Additional comments:** none

Depressions on peat substrates of the Rhynchosporion (7150)

The habitat occurs at Monivea Bog in both Active and Degraded Raised Bog, but it is only occasional found on degraded habitat. *Rhynchospora alba* and *R. fusca* were both recorded within the 2012 survey at this site.

R. alba is found in all ecotopes in Monivea Bog, such as: central ecotope (complex 14; 15; 10/15), sub-central ecotope (4/10; 6/10); sub-marginal ecotope (9/7/6; 6/3; 6/3/4; 6/3 (RB); 6/3/4 (RB)), marginal ecotope (3/76) and face bank ecotope (1). *R. fusca* is found only in one small area of the high bog at the edge of central ecotope (14).

The species becomes very frequent within complexes 14 and 15 (central); 4/10 (sub-central) and 6/3/4 and 6/3/4 (RB) (sub-marginal).

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

Appendix II Photographical records

Photograph Number	Aspect	Type	Feature	Date
23102012132	NE	Overview	Qc1	22/10/2012
23102012138	NE	Overview	Qsc1	23/10/2012
22102012129	NE	Overview	Qsc2	22/10/2012
23102012135	NE	Overview	Qsc3	23/10/2012

Appendix III Quadrats

Ecotope type	Central	Central	Subcentral	Sub-central
Complex Name	4/15	15	4/14	4/10
Quadrat Name	Qc1	Qc1	Qsc 1	Qsc1
Easting	154379	154380.79	154359	154361.58
Northing	234857	234858.70	235124	235123.59
Date	12/04/2005	23/10/2012	12/04/2005	23/10/2012
Firmness	quaking	Quaking	quaking	Very soft
Burnt	No	No	No	No
Algae in hollows %	4-10	Absent	Absent	Absent
Algae in pools %	4-10	Absent	Absent	1-3 (many indiv)
Bare peat %	1-3 (many indiv)	Absent	4-10	Absent
High hummocks %	na	Absent	na	Absent
Low hummocks %	11-25	34-50	11-25	34-50
Hollows %	11-25	4-10	11-25	4-10
Lawns %	34-50	4-10	4-10	11-25
Pools %	11-25	26-33	11-25	11-25
Pool type	Regular	Interconnecting	Interconnecting	Regular
S.austinii hum type	na	Active	na	Absent
S.austinii hum %	1-3 (many indiv)	11-25	4-10	Absent
S.austinii height(cm)	na	11-20	na	Absent
S.fuscum hum type	na	Absent	na	Absent
S.fuscum hum %	Absent	Absent	Absent	Absent
S.fuscum height(cm)	na	Absent	na	Absent
Leucobryum glaucum	Absent	Absent	na	Absent
Trichophorum type	Tussocks	Absent	Absent	Absent
Trichophorum %	4-10	1-3 (many indiv)	Absent	1-3 (few indiv)
S.magellanicum %	11-25	11-25	4-10	11-25
S.cuspidatum %	34-50	11-25	4-10	4-10
S.papillosum %	1-3 (many indiv)	4-10	4-10	26-33
S.denticulatum %	1-3 (many indiv)	1-3 (several indiv)	Absent	Absent
S.capillifolium%	4-10	4-10	4-10	4-10
S.tenellum %	na	Absent	na	1-3 (many indiv)

Ecotope type	Central	Central	Subcentral	Sub-central
Complex Name	4/15	15	4/14	4/10
S.subnitens %	na	Absent	Absent	Absent
R.fusca %	Absent	Absent	Absent	Absent
R.alba %	11-25	4-10	11-25	4-10
N.ossifragum %	1-3 (many indiv)	1-3 (several indiv)	1-3 (many indiv)	4-10
Sphag pools %	4-10	26-33	11-25	4-10
Dominant pool Sphag	S.cuspidatum	S.cuspidatum	S.cuspidatum	S.cuspidatum
Sphag lawns %	34-50	4-10	4-10	11-25
Sphag humm %	11-25	34-50	11-25	26-33
Sphag holl %	4-10	4-10	4-10	4-10
Total Sphag %	51-75	76-90	34-50	51-75
Hummocks indicators	S.austinii	S.austinii	S.austinii	Absent
Cladonia portent %	1-3 (many indiv)	1-3 (many indiv)	1-3 (many indiv)	11-25
Other Cladonia sp	na	C.uncialis	na	
C. panicea %	na	Absent	na	Absent
Calluna cover %	4-10	11-25	26-33	11-25
Calluna height(cm)	21-30	11-20	21-30	11-20
Menyanthes				
Other NotableSpecies		Aulacomnium V. oxy D.ang		Aulacomnium palustre
Other comment				S.austinii adj to quac

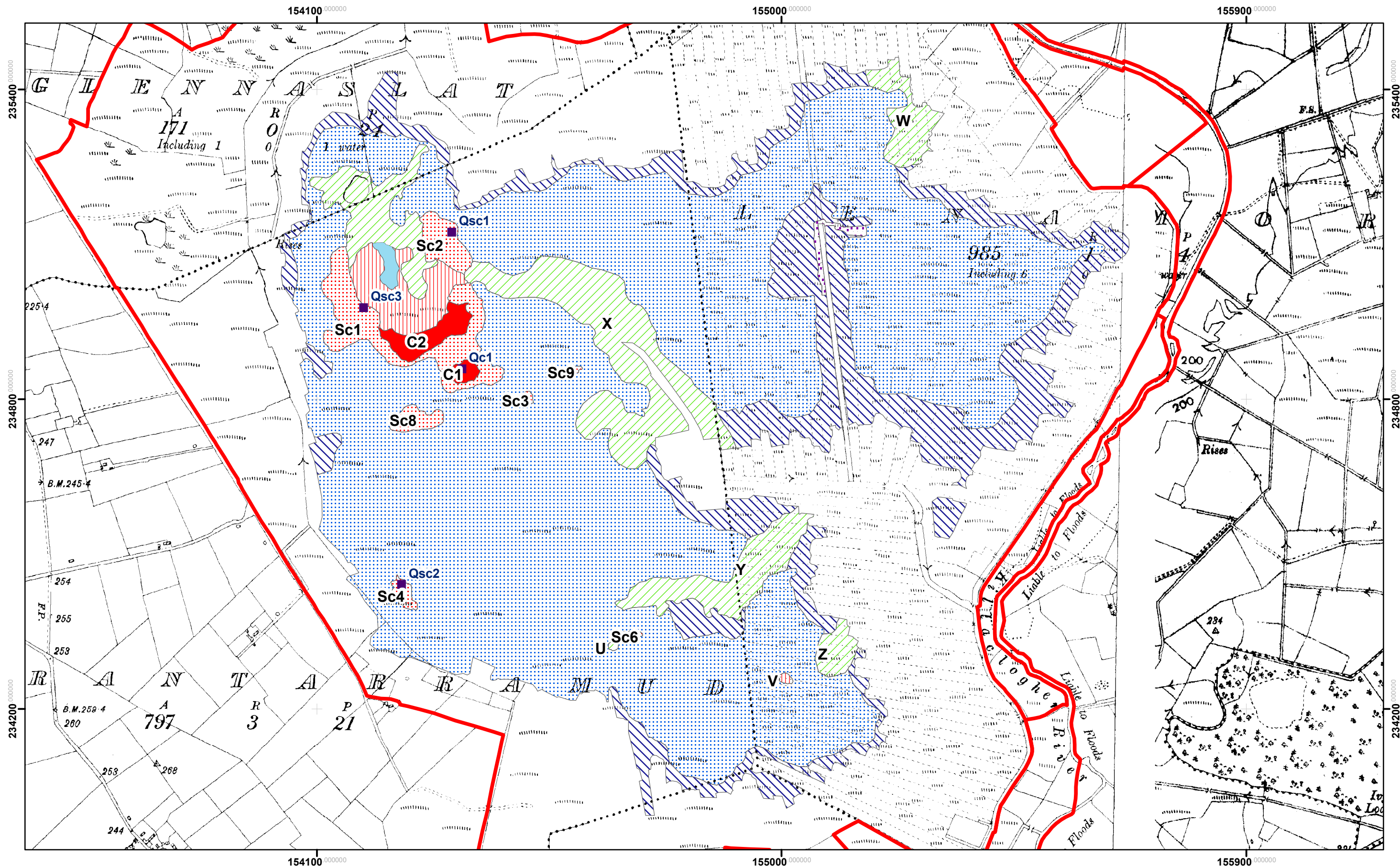
Ecotope type	Subcentral	Sub-central	Subcentral	Sub-central
Complex Name	4/10	6/10	9/7/10	9/7/10
Quadrat Name	Qsc2	Qsc2	Qsc 3	Qsc3
Easting	154262	154264.03	154191	154190.79
Northing	2344441	234440.52	234978	234977.22
Date	12/04/2005	22/10/2012	12/04/2005	23/10/2012
Firmness	quaking	Very soft	very soft	Very soft
Burnt	No	Severe	No	No
Algae in hollows %	na	Absent	na	Absent
Algae in pools %	na	1-3 (many indiv)	Absent	Absent
Bare peat %	na	4-10	Absent	Absent
High hummocks %	na	Absent	na	11-25

Ecotope type	Subcentral	Sub-central	Subcentral	Sub-central
Complex Name	4/10	6/10	9/7/10	9/7/10
Low hummocks %	11-25	11-25	11-25	34-50
Hollows %	11-25	4-10	4-10	11-25
Lawns %	26-33	4-10	4-10	Absent
Pools %	Absent	4-10	1-3 (many indiv)	Absent
Pool type	Absent	Regular	Regular	Absent
S.austinii hum type	na	Active	na	Absent
S.austinii hum %	Absent	1-3 (few indiv)	1-3 (many indiv)	Absent
S.austinii height(cm)	na	0-10	na	Absent
S.fuscum hum type	na	Absent	na	Absent
S.fuscum hum %	Absent	Absent	Absent	Absent
S.fuscum height(cm)	na	Absent	na	Absent
Leucobryum glaucum	na	Absent	Absent	Absent
Trichophorum type	Tussocks	Absent	Tussocks	Absent
Trichophorum %	4-10	Absent	na	Absent
S.magellanicum %	4-10	Absent	Absent	11-25
S.cuspidatum %	1-3 (many indiv)	1-3 (several indiv)	4-10	Absent
S.papillosum %	26-33	11-25	4-10	4-10
S.denticulatum %	Absent	Absent	Absent	Absent
S.capillifolium%	4-10	4-10	26-33	26-33
S.tenellum %	na	Absent	na	4-10
S.subnitens %	Absent	1-3 (many indiv)	na	Absent
R.fusca %	Absent	Absent	Absent	Absent
R.alba %	11-25	1-3 (many indiv)	Absent	Absent
N.ossifragum %	11-25	51-75	4-10	1-3 (many indiv)
Sphag pools %	Absent	1-3 (many indiv)	1-3 (many indiv)	Absent
Dominant pool Sphag	S.cuspidatum	S.cuspidatum	S.cuspidatum	
Sphag lawns %	26-33	4-10	4-10	Absent
Sphag humm %	11-25	11-25	11-25	34-50
Sphag holl %	4-10	1-3 (many indiv)	4-10	4-10
Total Sphag %	34-50	26-33	34-50	51-75
Hummocks indicators	Absent	S.fuscum	S.austinii	Absent
Cladonia portent %	na	Absent	1-3 (many indiv)	1-3 (many indiv)
Other Cladonia sp	na		na	C.uncialis
C. panicea %	na	Absent	na	1-3 (many indiv)
Calluna cover %	na	4-10	26-33	34-50

Ecotope type	Subcentral	Sub-central	Subcentral	Sub-central
Complex Name	4/10	6/10	9/7/10	9/7/10
Calluna height(cm)	21-30	0-10	21-30	21-30
Other NotableSpecies		D.anglica		Empetrum V.oxy Aulacomnium palustre
Other comment		Sphagnum cover adj to quad 51-75%		S. austinii and Molinia adj to quad

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

Appendix IV Survey maps



Raised Bog Monitoring & Assessment Survey 2013

Map 1: Ecotopes Map and Quadrats

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Monivea SAC (002352) Co. Galway

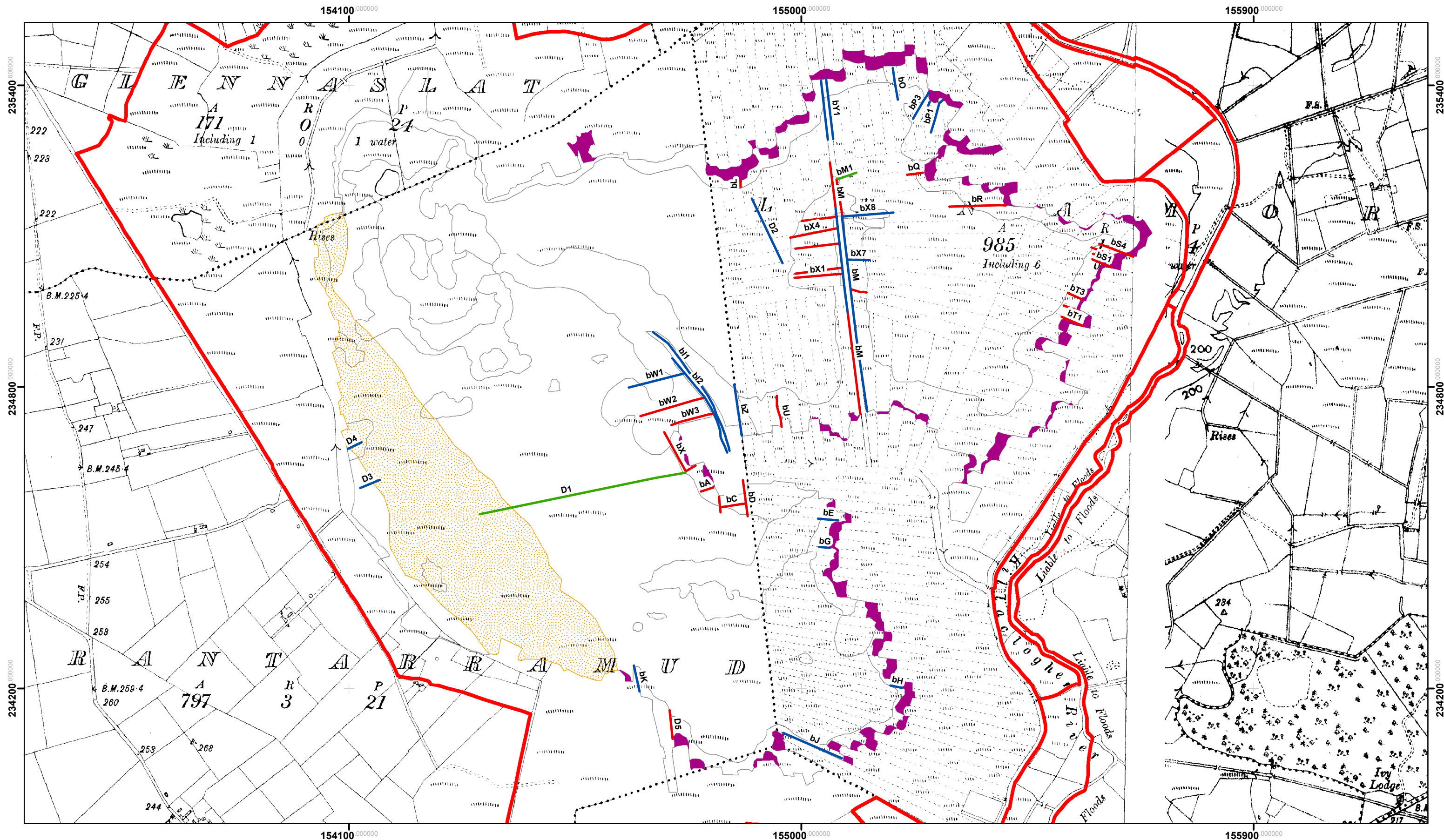
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0 90 180 360 540 720 Meters



Legend

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



Raised Bog Monitoring & Assessment Survey 2013 **Map 3: Impacts (High bog drainage; Turf cutting; Fire events)**

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Monivea SAC (002352) **Co. Galway**

1:7,000

0 95 190 380 570 760 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