Moanveanlagh Bog (SAC 002351), Co. Kerry

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 Moanveanlagh 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 4.59ha (3.88%) of the high bog area. There are no active flushes at the site, and high quality Active Raised Bog consists solely of a very small section of central ecotope, with *Sphagnum* pools and lawns, and hummocks and hollows the dominant features. *Sphagnum cuspidatum*-filled pools cover approximately 20% of the central ecotope area, and *Sphagnum* cover is as high as 90% in places. The interpool areas are very wet, with frequent low hummocks of *S. capillifolium*.

Degraded Raised Bog covers 113.58ha (96.12%) 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 the wettest of the community complexes recorded. It has a less developed micro-topography, while permanent pools and *Sphagnum* lawns are generally absent. The habitat also encompasses some inactive flushes, and other occasional small patches of flush vegetation that were too small to label as 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. The habitat was most common in the sub-central community complexes 4/10 and 6/4+P, found in the sub-central ecotope areas, **Sc4** and **Sc1**, respectively.

The current conservation objective for Moanveanlagh 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 71.62ha. The objective in relation to Structure and Functions (S&Fs) is that at least half of the Active Raised Bog area should be made up of the central ecotope and active flush (i.e. the wetter vegetation communities). These values have been set as Favourable Reference Values, or FRVs, until more site specific values can be set based on hydrological and topographical studies. The objective for Degraded Raised Bog is for the sub-marginal area to be restored to active peat forming communities as stated above and that no loss or degradation of any kind occurs. Although FRVs could not be established for the Rhynchosporion depressions, the objectives are to increase its extent and to improve its quality to values associated with a favourable conservation status of Active Raised Bog. Therefore, the habitat's objectives are indirectly associated with Active Raised Bog objectives.

There has been no real change in the area of Active Raised Bog at Moanveanlagh Bog in the 2005 to 2012 period. However, the mapped distribution of the habitat has changed somewhat, particularly in that a small area of central ecotope (**C1**) has now been mapped in the southwest of the site, surrounded by the sub-central, **Sc1** area. Active Raised Bog at the site had previously consisted only of sub-central ecotope. Some new peat forming areas have also been described at the site, in the form of two small areas of sub-central ecotope – **Sc3** and **Sc4** – although these, like the central **C1**, are thought to be the result of more comprehensive field mapping rather than actual changes. It is also probable that the original extent of Active Raised Bog in 1994 would have been close to the 2012 value (4.59ha).

The current Active Raised Bog at the site, which only covers 3.88% of the high bog (4.59ha), is mainly confined to a depression on the bog (**C1** and **Sc1**) caused by a major peat slippage/bog burst believed to have resulted from peat cutting and associated drainage (Kelly *et al*., 1995). No cutting has occurred in this area in recent years but the presence of a wide cutover zone in this area means that extensive cutting occurred here in the past. Similar smaller slippage/burst areas are found in different locations around the high bog margin thus indicating that the stability of this bog is particularly susceptible to turf cutting. It is critical that no further cutting takes place which could give rise to such occurrences. The other 3 sub-central areas (**Sc2, 3** and **4**) are associated with surface depressions and indicate potential vertical losses of water through the bog to the base of the bog or the underlying mineral soils, are likely to be a significant problem for the restoration of this bog. It is clear that turf cutting and drainage of the cutaway would exacerbate these effects.

The widespread and common occurrence of the invasive *Sarracenia purpurea* over much of the high bog was also noted in the present survey.

Peat cutting, drainage and the spread of the invasive *Sarracenia purpurea* are the most threatening current impacts at the site. Peat cutting has directly diminished the extent of both marginal and face bank ecotopes and thus is considered to have had a high importance on Degraded Raised Bog. No variation in Active Raised Bog has taken place in the reporting period and thus peat cutting has been given a low importance/impact on Active Raised Bog and Rhynchosporion depressions. 0.75ha of high bog has been lost in the reporting period due to peat cutting. 1.14km of drains remain functional and 0.37km reduced functional. No fire events have affected the 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. However, both Area and S&Fs values are below favourable reference values. Future Prospects are considered Unfavourable Bad-Declining as impacting activities (peat cutting, drainage and the spread of invasive species) continue to threaten the habitat.

It could be argued that the lack of a recent decrease in the area of Active Raised Bog means that turf cutting has not had a significant adverse impact on the bog in recent years. However, turf cutting and associated drainage has caused a major decrease in the area of uncut bog from 333 ha to 117ha of uncut bog and of active bog from 333 to 4.6 ha. Even after restoration works and a long recovery period the best that can be achieved is less than 20ha of Active Raised Bog. Hence indicating that peat cutting has already had a serious negative impact over a long period at this site and its continuation prevents the recovery of the high bog, and the recovery of Active Raised Bog towards FRV's. In addition, restoration works cannot be successfully deployed until peat cutting stops.

Turf cutting has the potential to instigate instability and possibly bog burst/peat slippage within the bog, as it has elsewhere in the bog. While this may give rise locally to suitable conditions for active bog formation it does so at the expense of increasing slopes in adjacent parts of the bog, and therefore their restoration potential, and decreasing the long term stability of the bog. The habitat's future in these restricted areas depends on the stability of the bog topography. If activities which encourage subsidence, such as cutting and drainage, are occurring this will further destabilise the topography of the bog and threaten the remnants of active bog. This is obviously a very unstable and undesirable situation.

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 **Moanveanlagh SAC** has been given an **Unfavourable Bad-Declining** assessment.

A series of **recommendations** have been also given, these include: the cessation of peat cutting; blocking of remaining functional and reduced functional drains; restoration works on the high bog and cutover areas; an assessment of the actual impact of forestry plantations adjacent to the high bog; further hydrological and topographical studies to ascertain more accurate FRVs; a targeted program to eliminate or greatly reduce the alien species *Sarracenia purpurea* and further botanical monitoring surveys.

Site identification

SAC Site Code	002351	**6" Sheet:**	KY 11
Grid Reference:	R 04 35	**1:50,000 Sheet:**	64
High Bog area (ha):	118.17ha		
Dates of Visit:	10 & 11 October 2012		
Townlands:	Carhooearagh, Kylebwee, Bunagarha.		

[1] The current extent of the high bog is 118.17ha, while that reported in 2005 was 119.83ha (Fernandez *et al*., 2005). This discrepancy is the result of more accurate mapping of the high bog edge in 2012. High bog area has decreased by 0.75ha in the 2004/05-2012 period due to peat cutting. The actual high bog extent in 2004 was 118.92ha (see tables 8.1 and 8.3 2004 (amended) figures).

Site location

Moanveanlagh Bog is approximately 6km east-northeast of Listowel in Co. Kerry.

It is in the extreme southwest of the range of raised bogs in Ireland. Sheheree bog SAC (000382), approximately 3km northeast of Killarney town, is further southwest. Bunnaruddee Bog (NHA 1352) is approximately 6km north-northwest of Moanveanlagh Bog.

The site was accessed on the eastern side, from a small road leading northwards off the R523. Access may also be gained along the western side of the bog, from the road between Bolton's Cross and Ahavoher Bridge.

Description of the survey

The survey was carried out in October 2012 and involved a vegetation survey of the high bog at Moanveanlagh Bog and the recording of impacting activities affecting high bog vegetation. A similar survey was carried out in 2005 by Fernandez *et al*. (2005). High bog vegetation was described and mapped, based on raised bog ecotope vegetation community complexes developed by Kelly and Schouten (2002). Detailed notes were taken on each community complex and any flushed areas that were present. These included: species lists; estimation of % cover of dominant species; percentage *Sphagnum* cover; evidence of damage (due to burning, peat cutting or drainage); micro-topography; ground firmness; and presence of *Cladonia* species. A list of photographical

records is given in Appendix II. The survey aimed to assess the conservation status of Habitats Directive (Council Directive 92/43/EEC) Annex I habitats on the high bog.

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

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

A digital vector format ecotope vegetation map was produced based on the spatial data collected during the survey using ArcGIS 9.3 and 2012 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

Moanveanlagh Bog has been classified as a Western Raised Bog (Cross, 1990), and geomorphically as a Ridge Basin Bog (Kelly *et al*., 1995). The bog has been extensively cutaway all around the margins, although particularly so along the east and west sides. The remaining high bog is elongated in an approximate NNE-SSW direction.

Ecological Information

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

The following Raised Bog EU Annex I habitats, are found in Moanveanlagh 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 Moanveanlagh Bog is 4.59ha (3.88% of the high bog).

Kelly *et al*. (1995) reported a total of 5.9ha of Active Raised Bog within the site in 1994/95. The original 1994/95 ecotope figures were adjusted by Fernandez *et al*. (2005) to take into account slight discrepancies in the area of bog considered high bog between Kelly *et al*. (1995) and Fernandez *et al*. (2005). The original Kelly *et al*. (1995) Active Raised Bog figure was reviewed and reduced to 2.75ha by Fernandez *et al*. (2006) in 2004/05. Kelly *et al*. (1995) deemed sub-central ecotope all the pools area within the bog burst. However, during the 2004/05 survey only those pools areas with at least 20-30% Sphagnum cover were deemed Active Raised Bog. This variation in habitat extent was considered to be the result of re-interpretation of vegetation. Nevertheless, Fernandez *et al*. (2005) reported no actual variation in habitat extent in the 1994/95 to 2005 period.

The 2012 survey reported 4.59ha of Active Raised Bog at this site. The discrepancy between the 2012 (4.59ha) and the 2004/05 amended Active Raised Bog value (2.75ha) is considered to be the result of more comprehensive surveying and thus accurate mapping in 2012. As a result the 1994/95 habitat extent was also likely to be close to the 2012 value.

Active Raised Bog at the site currently includes central and sub-central ecotope.

Central ecotope was found at a single location, **C1**, in the southwest of the bog (see Appendix IV, Map 1). This small area of only 0.17ha was entirely surrounded by sub-central ecotope (**Sc1**) and was comprised of a single community complex. Complex 15 is wet, with very soft to quaking ground and interconnecting pools, with abundant *Sphagnum cuspidatum*, covering 20% of the complex. Total *Sphagnum* cover is 76-90%, and in addition to pools, the micro-topography includes low hummocks, hollows and lawns. Interpool areas are very wet, and dominated by *Sphagnum*, much of which is comprised of low *S. capillifolium* hummocks. *S. papillosum* is also common in hummocks and at pool edges, while low hummocks of *S. fuscum* and *S. austinii* are occasional in the complex. *Campylopus atrovirens* was present in the complex, as was the invasive *Sarracenia purpurea*, albeit at low frequency. **C1** was not previously identified at the site, however this area was probably already present prior to 2005 and its detection in 2012 to be the result of more comprehensive field mapping rather than due to real changes.

Sub-central ecotope was found at four locations (**Sc1** to **Sc4**). Four community complexes (and an additional variant of one of the four) were recorded throughout the ecotope. Complex 10/9 is wet, with a micro-topography of low hummocks, hollows, lawns and pools. Small, regular pools, with

variable *Sphagnum* cover – mostly *S. cuspidatum* in pools and *S. papillosum* at pool edges – cover 5-10% of the complex. The total *Sphagnum* cover is 51-75% and this, together with the relatively high cover of *Eriophorum vaginatum* (and *E. angustifolium*) characterises the complex.

Complex 9/10 is similar to 10/9, but has a somewhat higher cover of *Eriophorum vaginatum*, although total *Sphagnum* cover is in the range of 51-75%, albeit at the lower end of that range. The overall cover of interconnecting pools is 11-25%, and *Sphagnum* cover (mostly *S. cuspidatum*) within pools is generally high. In addition to pools, the micro-topography consists of low hummocks, hollows and lawns. However, the micro-topography in general, and like that of complex 10/9, is somewhat poorly developed, particularly around the pools, with only occasional hummocks, and little diversity around the pools. The invasive *Sarracenia purpurea* is present at 11-25% frequency in the complex.

Complex 4/10 is also wet, with total *Sphagnum* cover of 51-75%. Pool cover, however, is only in the range of 1-4%. The complex is characterised by the abundance of *Rhynchospora alba* (34-50% cover), while the common *Sphagnum* species include *Sphagnum capillifolium*, *S. papillosum*, *S. magellanicum* and *S. cuspidatum*. Small hummocks of *S. fuscum* and *S. austinii* are also present. Where the *Sphagnum* cover decreases, this complex grades into the sub-marginal complex 9/7/4.

Complex 6/4+P is characterised by soft to very ground, pool cover of 5-10%, total *Sphagnum* cover of 34-50% and the relative frequency of *Rhynchospora alba* (11-25%). *Sphagnum* cover of pools is patchy, while low interpool hummocks are dominated by *S. capillifolium*. In addition to pools, the micro-topography encompasses high hummocks, low hummocks and hollows. *Pleurozia purpurea* and *Campylopus atrovirens* are both present in this complex, although only rarely, at pool edges. 6/4+P characterised most of the sub-central **Sc1** area. However, in the west side of **Sc1**, a lower cover of *Rhynchospora alba* and correspondingly higher cover of *Eriophorum vaginatum* suggested 6/9+P as a more appropriate community complex classification. As this related to only a small area and a few mapping points, 6/9+P was treated as a variant of 6/4+P, and labelled as such under the description for 6/4+P (Appendix I).

The boundary of the sub-central, **Sc1** and **Sc2** has been slightly amended as a result of the more comprehensive surveying and accurate mapping of the present survey.

Sc3 and **Sc4,** which overall extent is only 0.14ha, are previously unmapped Active Raised Bog areas, although neither are likely to be newly-formed, but rather the result of more comprehensive mapping, in places that were poorly surveyed before.

Degraded Raised Bog (7120)

The current area of Degraded Raised Bog at Moanveanlagh Bog is 113.58ha (96.12% of the high bog).

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

The sub-marginal ecotope features the most developed micro-topography within Degraded Raised Bog, although pools are absent. Much of the sub-marginal ecotope at the site was broadly similar and was all classified in one of two community complexes - 9/7/6 (including the variant 9/7/6+Myrica) or 9/7/4.

Sphagnum cover within sub-marginal ecotope rises to 34-50% in complex 9/7/4, which grades into the sub-central complex 4/10 where *Sphagnum* cover increases. The micro-topography across the whole sub-marginal ecotope generally consists of low hummocks and hollows, with *S. capillifolium* the dominant hummock species. Other *Sphagnum* species include *S. papillosum*, *S. tenellum*, *S. fuscum* and *S. austinii*. Common interpool species include *Narthecium ossifragum*, *Carex panicea*, *Eriophorum vaginatum* and *Erica tetralix*.

Marginal ecotope is slightly drier than sub-marginal ecotope and occurs as a narrow band around most of the high bog margin. The micro-topography consists of *Calluna vulgaris* hummocks, low *Sphagnum* hummocks, flats and very occasional hollows and tear pools. The *Sphagnum* cover here (usually up to 10%) is lower than in the sub-marginal ecotope, and the vegetation is characterised by a higher cover of *Narthecium ossifragum, Trichophorum germanicum,* and *Calluna vulgaris*.

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

The high bog also has two inactive flushes (flush **Y** and flush **Z**), both of which are dominated by *Molinia caerulea*. Other occasional inactive flush mapping points on the high bog indicate patches of vegetation that were too small and/or scattered to be mapped and labelled as distinct flushes.

Depressions on peat substrates of the Rhynchosporion (7150)

Rhynchosporion vegetation is widespread on Moanveanlagh 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. It was most frequent in the sub-central complexes 4/10 and 6/4+P, and also in the sub-marginal complex 9/7/4.

In these areas, the Rhynchosporion vegetation occurs within *Sphagnum* hollows and along *Sphagnum* pool edges and on lawns. Typical plant species include *Rhynchospora alba*, *Sphagnum cuspidatum, S. papillosum*, *Drosera anglica* and *Eriophorum angustifolium*.

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

Detailed vegetation description of the high bog

A detailed description of high bog vegetation recorded during the 2012 survey of Moanveanlagh 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 Moanveanlagh Bog, according to their occurrence on the high bog or adjacent to the high bog; area or length affected, and whether they influence negatively (i.e. drainage, peat extraction) or positively (i.e. restoration works):

Table 6.1 Impacting activities

Code	Activity	Ranking	Influence	Area (ha) /Length(km)	Location	Habitat affected
C01.03	Peat extraction	H	-1	0.75ha	Inside High Bog: 24 locations	**7120**
C01.03	Peat extraction	L	-1	0.75ha	Inside High Bog: 24 locations	**7110/7150**
J02.07	Drainage	M	-1	1.510km [1]	Inside High Bog	**7110/7120/7150**
J02.07	Drainage	M	-1	n/av	Outside High Bog	**7110/7120/7150**
I01	Invasive alien species	H	-1	n/a	Inside High Bog	**7110/7120/7150**
B01.02	Artificial planting on	L	-1	5.8ha	Outside	**7110/7120/7150**

open ground (non-native trees)	High Bog

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

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

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

Peat cutting

Peat cutting has taken place at 24 locations on the high bog margin in the period 2004/5-2012. Of these 24 locations (plots), 16 were in the south-eastern side of the bog, 3 to the northwest, 2 to the west, and 1 along the east side. This has reduced the area of high bog by 0.75ha. The loss of high bog is calculated using GIS techniques on aerial photography from 2004/05 and 2012.
Information from the NPWS indicates that cutting took place at 32 plots in the 2010-2011 period and that approximately 24 plots were cut on Moanveanlagh Bog in 2012 and 22 in 2013. Therefore, cutting rate seems not to have declined in the reporting period.

Habitat losses associated with peat cutting in the current reporting period have been confined to the marginal and face bank ecotopes in the reporting period, and the activity is therefore assessed as having a negative impact of high importance on Degraded Raised Bog.

The impact of peat cutting on Active Raised Bog and Depressions on peat substrates of the Rhynchosporion is thought to be low as there has been no loss of habitat during the reporting period (2005-2012).

The current Active Raised Bog at the site is almost totally confined to a small area in the west of the site (comprising **C1** and **Sc1**), and corresponds with a major peat slippage/bog burst area, similar to that described for Carn Park Bog SAC . This is quite atypical among raised bogs, in that it is believed to have resulted from a slump caused by peat cutting and associated drainage (Kelly *et al*., 1995). Concentric lines of large tear pools formed from the slump are clearly visible on aerial photographs, and vegetation within it is not of the finest quality. The area involved covers approximately 6.6 ha and extends 350m into the bog. Based on air photos it is apparent that this slippage/burst took place before 1995. No cutting has occurred in this area in recent years but the presence of a wide cutover zone in this area means that extensive cutting occurred here in the past. Directly to the north is another smaller slippage/burst area covering 1.2ha and with cracking extending approximately 90m into the bog. There has been recent cutting and drainage in this area and the cracking appears to be becoming more evident on the aerial photos over time, being hardly visible in 1995, more developed in 2000, well developed in 2004 and very evident in 2012. Slopes in this area are too steep for active bog development even if the cracking did not cause significant

drying out. The occurrences of these two peat slippage features, and a possible third one on the east side of the bog, indicates that the stability of this bog is particularly susceptible to turf cutting. It is critical that no further cutting takes place which could give rise to such occurrences. The other 3 sub-central areas (**Sc2, 3** and **4**) were also recorded during the 2012 survey as being associated with surface depressions. These depressions indicate that vertical losses of water through the bog to the base of the bog or the underlying mineral soils, as have occurred at Clara Bog, are likely to be a significant problem for the restoration of this bog. It is clear that turf cutting and drainage of the cutaway would exacerbate these effects.

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.

Drainage

High bog drainage

Table 6.2 shows no change in the status of high bog drains. The majority of drains in the high bog remain functional (1.140km), while 0.370km of reduced functional, and 0.193km of non-functional drains (both figures unchanged), also remain. Functional drains impart a significant negative impact on the high bog through the discharge of water, while 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.

No blockage of drains has occurred to date on the site.

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

Table 6.2 High bog drainage summary

Status	2005 (km) [1]	2012 (km)	Change
NB: functional	1.140	1.140	0.000
NB: reduced functional	0.370	0.370	0.000
NB: non- functional	0.193	0.193	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)

As table 6.2 indicates there has been no change in the length of drains in the current reporting period.

Table 6.3 below provides a more detailed description of the drainage present on the high bog at Moanveanlagh 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	0.044	NB: functional	NB: functional	No	
bB1	0.140	NB: functional	NB: functional	No	
bB2	0.043	NB: functional	NB: functional	No	
bC	0.023	NB: functional	NB: functional	No	
bD	0.102	NB: reduced functional	NB: reduced functional	No	
bE	0.072	NB: reduced functional	NB: reduced functional	No	
bF	0.00	n/a	n/a	No	Drain no longer present on the ground, nor obvious on the 2005 aerial photographs. Thus likely to have been cut away by peat cutting prior to 2005. Thus not variation in the 2005-2012 period.
bG	0.00	n/a	n/a	No	””
bH	0.00	n/a	n/a	No	””
bJ	0.00	n/a	n/a	No	””
bK	0.088	NB: functional	NB: functional	No	This drain was wrongly classified as reduced functional in 2005
bL	0.167	NB: functional	NB: functional	No	
bM	0.125	NB: functional	NB: functional	No	
bN1-3	0.159	NB: functional	NB: functional	No	
bO	0.064	NB: reduced functional	NB: reduced functional	No	
bP	0.032	NB: functional	NB: functional	No	
bQ	0.081	NB: functional	NB: functional	No	
bR	0.079	NB: functional	NB: functional	No	
bS	0.108	NB: reduced functional	NB: reduced functional	No	This drain was wrongly classified as non-functional in 2005

bT	0.159	NB: functional	NB: functional	No
bV	0.193	NB: non-functional	NB: non-functional	No
bW	0.024	NB: reduced functional	NB: reduced functional	No

None of the high bog drains are believed to have undergone a change in status, although several drains in the south of the site - bF, bG, bh and bJ - were not detectable on the ground during the present survey. However, these drains were also not clearly discernible on the 2005 aerial photographs and are thus likely to have been cut away by peat cutting prior to 2005. Thus, this does not represent a change in the status of high bog drains in the 2005-2012 period.

Bog margin drainage

The cutover areas were not surveyed for drains during 2012, although drains associated with either currently active or no longer active peat cutting are present along most of the cutover. These drains continue to discharge water from the high bog and impacting on high bog habitats.

Fernandez *et al*. (2005) referred to the maintenance of drains associated with actively cut face banks and considered the activity to have a high intensity and high negative influence. This impact is likely to have continued, but is assessed here as having a medium negative influence, in the absence of definitive evidence of a high intensity impact.

Fire history

Although no evidence of recent burning events was noted during the present survey, the site has previously been affected by regular burning over a long period. Douglas and Grogan (1987) recorded that most of the site was burnt 4 years before their survey, while Kelly *et al*. (1995) referred to extensive fire damage on both the high bog and southern cut away areas dating from 1987-1992. Another burning event affected the middle section of the bog in 1993, while another event between 1995-2000 affected 0.7ha, also in the middle section of the high bog (Fernandez, 1995).

No fire events have been reported on the high bog in the 2005-2011 reporting period.

Invasive species

Sarracenia purpurea is common over much of the high bog, and only becomes infrequent or occasional in the most northerly parts. It was also common in 2005, and was described by Fernandez *et al*. (2005) as present throughout the site and forming very large colonies in several

places. The widespread colonisation of the site is apparently relatively recent, as Douglas and Grogan (1987) referred to only a single large stand of the species in the southeast of the bog.

There are no other significant stands of invasive species on the high bog. *Rhododendron ponticum* was noted in an isolated patch of flush vegetation (the former Flush 'X', now mapped as an isolated inactive flush point). A single *Pinus contorta*, 1.5m tall, was noted in an isolated stand of flush vegetation in the southwest of the bog.

Based primarily on the widespread and common occurrence of *Sarracenia purpurea*, invasive species are considered to have a negative impact of high importance on high bog habitats.

Afforestation and forestry management

There are two conifer plantations, one of 3.4ha and the other of 2.4ha, on the cutover to the east of high bog. These are likely to be imparting only a low impact on high bog habitats, as they are isolated from the high bog by quite extensive tracts of cutover.

Other impacting activities

A car has been dumped in the sub-central **Sc1** area, although this appears to be the same one mentioned by Kelly *et al*. (1995), indicating that such dumping may not be a persistent problem at the site. Kelly *et al*. (1995) also referred to previous accounts of the dumping of domestic refuse around the site, although little of this was noted during the site visit for the current survey.

No other significant impacting activities were noted or recorded in 2012.

Conservation activities

Although no physical management actions such as the blocking of drains or the restoration of the former peat exploitation area, which would also require the blocking of drains, have been carried out to improve the conservation status of the high bog habitats, the NPWS has engaged in negotiation with landowners in relation to the cessation of peat cutting at the site. Despite these negotiations, peat cutting continues at the site, with an approximate 24 active plots in 2012.

Conservation status assessment

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

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

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

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

Active Raised Bog (7110)

Area

Although table 8.1 indicates no change in the area 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. A new area of central ecotope (**C1**) was mapped within the sub-central **Sc1** area. However, this is unlikely to reflect a real change at the site, as there were clear deficiencies in the mapping of this area in 2005. **Sc1** was mapped in 2005 on the basis of a few scattered points on its east, west and southern boundary, with the more northerly section, where **C1** has now been mapped, devoid of mapping points.

The **Sc1** boundary has also been slightly changed, which can also be attributed to the more intensive mapping effort involved in the present survey.

Sc2 in the southeast of the site has also been mapped more comprehensively than before and the boundary has thereby undergone some slight changes.

Two new, small sub-central areas - **Sc3** to the north of **Sc1**, and **Sc4**, towards the northwest of the high bog - have been mapped here. Neither are thought to represent real change to the high bog, as the previous lack of mapping points in these areas (Fernandez *et al*., 2005) clearly indicates.

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 71.62ha (based on 1994/5 Kelly (1995) figures amended by Fernandez *et al.* (2005), see tables 8.1 and 8.3 below). This FRV is only approximate until further hydrological and topographical studies are carried out in order to assess the maximum potential capacity of the high bog to support Active Raised Bog. The current habitat Area value of 4.59ha is 93.59% below the FRV. A current Area value more than 15% below FRV falls into the **Unfavourable Bad** assessment category. Although a long term (1994/5-2012) trend indicates an increase in the area of Active Raised Bog at the site (1.84ha) (see table 8.1), these data are not directly comparable, due to the widely different survey methods used (i.e. more comprehensive surveying in 2012), and the increase is, therefore, not regarded as a real change. Furthermore, the actual extent of Active Raised Bog in 1994/95 was likely to be similar to the current 2012 value, as previously mentioned in the report. A more relevant and short term trend analysis (7 years; 2005-2012) indicates no change in the area of Active Raised Bog. Therefore, the habitat Area is given a **Stable** trend assessment.

The Area of Active Raised Bog at Moanveanlagh 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 2.30ha (half of 4.59ha, the current area of Active Raised Bog). The current value is 0.17ha which is 92.61% below the FRV. As a value exceeding 25% below FRV falls into the Unfavourable-Bad assessment category. Therefore, S&Fs are given an **Unfavourable-Bad** assessment.

A long term (1994/5-2012) trend indicates an increase in the area of central ecotope, although this cannot be recorded as a real change due to the widely different survey methods used (i.e. more comprehensive surveying in 2012), while a more relevant and short term trend (7 years; 2005-2012) shows no change, and the S&Fs are therefore given a **Stable** trend.

Quadrats analysis (**Qsc1**) indicates the following:

Qsc1: this quadrat was previously classified as 6/4+P+My (*Myrica*), but was classified in 2012 as 6/4+P. This does not represent a change to the habitat however, as the presence of *Myrica gale* was noted in the 2012 quadrat. The principal differences between the quadrats were the greater cover of pools and *Sphagnum* pools in 2005, 26-33% and 11-25%, respectively, compared to 11-25% and 1-3% in 2012. Low hummocks and *Sphagnum* hummocks both had 34-50% cover in 2012 but only 4-10% cover in 2005, which would probably account for the difference in *S. capillifolium* cover – 26-33% in 2012 and 4-10% in 2005, and therefore also largely explain the difference in total *Sphagnum* cover – 34-50% on 2012 and 11-25% in 2005. *Calluna vulgaris* cover was also higher in 2012 – 26-33%, compared to 4-10%, although this may be at least partly due to the greater pool cover in 2005, which clearly reduces the area likely occupied by *Calluna*. It is likely that no real significant changes have occurred, as those differences outlined above are all likely to be due to a slight discrepancy in the quadrat location.

All other quadrats recorded in 2012 (Q**c1**, Q**sc2** & Q**sc3**) represented new quadrat locations and are therefore not directly comparable to 2005 data.

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

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

Future Prospects

Habitat Area has remained unchanged and S&Fs are assessed as Stable in the 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 or conifer plantations. Peat-cutting continues at the site, with 24 active turf cutting plots in the 2004/05-2012 reporting period and an approximate 24 identified in 2012 and 22 in 2013.

It could be argued that the lack of a recent decrease in the area of Active Raised Bog means that turf cutting has not had a significant adverse impact on the bog in recent years. As can be seen when viewed in the longer term (200+ years), turf cutting and associated drainage has caused a major decrease in the area of uncut bog from 333 ha to 117ha of uncut bog and of active bog from 333 to 4.6 ha. Even after restoration works and a long recovery period the best that can be achieved is less than 20ha of Active Raised Bog. Restoration works cannot be employed until peat cutting stops. In more recent times the apparent lack of impact on the tiny remaining remnant of active bog may be due to the fact that it now seems to be confined to topographic depressions on the bog covering

4.59ha or 3.88% of the high bog and is 93.59% below the FRV target. Hence indicating that peat cutting has already had a serious negative impact over a long period at this site and its continuation prevents the recovery of the high bog, and the recovery of Active Raised Bog towards FRV's.

Turf cutting has the potential to instigate instability and possibly bog burst/peat slippage within the bog, as it has elsewhere in the bog. While this may give rise locally to suitable conditions for active bog formation it does so at the expense of increasing slopes in adjacent parts of the bog, and therefore their restoration potential, and decreasing the long term stability of the bog.

The habitat's future in these restricted areas depends on the stability of the bog topography. If activities which encourage subsidence, such as cutting and drainage, are occurring this will further destabilise the topography of the bog and threaten the remnants of active bog. This is obviously a very unstable and undesirable situation.

In addition, the invasive *Sarracenia purpurea* has spread throughout the site and is likely to continue to do so if left unchecked. Douglas and Grogan (1987) referred to only a single large stand of the plant in the southeast of the bog, indicating a relatively rapid recent spread.

Habitat **Area** is currently 93.59% below FRV (see table 8.4) and a Decreasing trend is foreseen due to ongoing impact from 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 92.61% below FRV (see table 8.4) and a Declining trend is also foreseen. Therefore S&Fs are expected to be more than 25% below FRV in the following two reporting periods. **S&Fs Future Prospects** are assessed as **Unfavourable Bad-Declining**. **The overall habitat's Future Prospects are Unfavourable Bad-Declining** (see table 8.5).

There is some potential for the restoration of cutover around the entire site, but particularly along the west and east, as the cutover is more extensive there. 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 have been no very recent significant fire events on the high bog, although such events have regularly occurred in recent years. Such events should continue to be curtailed in order to minimise potential damage to high bog habitats.

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

Table 8.1 Changes in Active Raised Bog area

Active Ecotopes	1994[1]	2005	2005 (amended)	2012	Change (2005-2012)	
	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	%
Central	0.00	0.00	0.17	0.17	0.00	0.00
Sub-central	2.75	2.75	4.42	4.42	0.00	0.00
Total	**2.75**	**2.75**	**4.59**	**4.59**	**0.00**	**0.00**

[1]These are the figures calculated from the vegetation map drawn by Kelly *et al*., (1995) that was geo-referenced, digitised and in some cases adjusted as part of Fernandez *et al*. (2005) project. Kelly *et al*. (1995) originally reported 5.9ha of Active Raised Bog and this figure was amended to 2.75ha by Fernandez *et al*. (2005) due to reinterpretation of vegetation. More recent data gathered during the 2012 survey indicates that the actual extent of Active Raised Bog in 1994/95 was likely to be similar to the 2012 value (4.59ha) which was the result of more comprehensive surveying and thus accurate mapping in 2012.

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	Newly recorded (Stable)	This specific area within **Sc1** 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.	Qc1-New 2012 quadrat.
Sc1	Qsc1	Stable	Slight changes in boundary (slightly larger). This change is the result of more comprehensive surveying in 2012 which resulted in more accurate mapping.	Greater cover of pools and *Sphagnum* pools in 2005; higher cover of low hummocks, *Sphagnum* hummocks and *S. capillifolium* in 2012. Total Sphagnum cover and *Calluna vulgaris* cover greater in 2012. All differences likely due to minor difference in quadrat location.
Sc2	Qsc2	Stable	Slight changes in boundary (slightly larger). This change is the result of more comprehensive surveying in 2012 which resulted in more accurate mapping.	Qsc2-New 2012 quadrat.
Sc3	Qsc3	Newly recorded	This specific area was not surveyed in 2005. This is likely to be the	Qsc3-New 2012 quadrat.

		(Stable)	result of more comprehensive surveying in 2012 which resulted in more accurate mapping.
Sc4	None	Newly recorded (Stable)	This specific area was not surveyed in 2005. This is likely to be the result of more comprehensive surveying in 2012 which resulted in more accurate mapping.

Degraded Raised Bog (7120)

Area

The Degraded Raised Bog FRV for Area is 46.55ha at Moanveanlagh Bog. This value corresponds with the difference between the current high bog area (118.17ha) and the Active Raised Bog FRV (71.62ha) 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 144.00% bigger than FRV. Any habitat Area value more than 15% above FRV falls into the **Unfavourable Bad** assessment category, and that is, therefore, the assessment that applies to habitat Area (see table 8.4).

Table 8.3 shows a 0.75ha decrease in the area of Degraded Raised Bog ecotopes as a result of peat cutting in the reporting period 2004/5-2012; therefore the habitat is given a **Decreasing** trend.

The Area of Degraded Raised Bog at Moanveanlagh Bog is, therefore, 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 28.10ha (25% of 113.58ha, the current area of Degraded Raised Bog). The current marginal and face bank ecotopes area value (35.81ha) is 27.46% above the FRV (in the particular case of Degraded Raised Bog a current area value equal or smaller than FRV is desirable) (see Table 8.4). A current value more than 25% above FRV falls into the **Unfavourable Bad** assessment category.

S&Fs trend is assessed based on actual changes within marginal and face banks ecotope (e.g. decreases due to rewetting processes or increases as a result of further drying out). Table 8.3 shows 0.75ha decrease on both marginal and face bank ecotopes during the current reporting as a result of

peat cutting. Thus, actual changes in the original extent of marginal and face bank ecotope as a result of drying out processes have not been reported for the reporting period. Thus, the DRB's S&Fs at Moanveanlagh Bog are given a **Stable** trend.

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

Numerous modifications to the mapped areas of ecotopes have resulted from more comprehensive surveying and accurate mapping in 2012. The sub-marginal boundary has been extended into former marginal ecotope in much of the north and northeast of the high bog, whereas the converse is the case in other parts of the bog. In the case of the marginal/sub-marginal boundary, it may also be partly explained by the existence of fairly wide zones that were rather transitional in nature, between marginal and sub-marginal ecotope, such that there were often quite wide areas in which the vegetation could justifiably been classified as either marginal or sub-marginal. The boundaries of flushes Y and Z have also been slightly changed by the more comprehensive surveying that took place in the current project.

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 Moanveanlagh Bog are assessed as Unfavourable Bad-Stable (see table 8.5).

Future Prospects

The area of Degraded Raised Bog has decreased (albeit to an unmeasured extent) as a result of peat cutting. This activity continues at the site and thus further habitat losses will take place. 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 face bank ecotopes to sub-marginal and/or Active Raised Bog. In addition, the invasive *Sarracenia purpurea* has colonised large areas of the high bog and is likely to continue to spread and cause a decline in the natural vegetation cover. There are currently no remediation works at the site that might contribute to the restoration of good quality habitat. Habitat **Area** is currently 144.00% 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 27.46% above FRV (see table 8.4). A Declining trend is foreseen in the following two reporting periods as a result **S&Fs** are expected to remain more than 25% above FRV. Thus, habitat's **S&Fs Future Prospects** are assessed as **Unfavourable Bad-Declining**.

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

Table 8.3 Changes in Degraded Raised Bog area

Inactive Ecotopes	**1994[1]**	**2005**	**2005 (amended)**	**2012**	**Change (2005-2012)**	
	Area (ha)	**Area (ha)**	**Area (ha)**	**Area (ha)**	**Area (ha)**	**%**
Sub-marginal	68.87	68.44	69.39	69.39	0.00	0.00
Marginal	39.78	37.61	35.21	34.61	(-)0.60	(-)1.70
Face bank	n/a	1.99	1.35	1.20	(-)0.15	(-)11.11
Inactive flush	8.73	8.73	8.38	8.38	0.00	0.00
Total	**117.38**	**116.77**	**114.33**	**113.58**	**(-)0.75**	**(-)0.66**

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

Note: Table 8.3 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 Moanveanlagh Bog is assessed as Unfavourable Bad-Declining (see table 8.5).

Depressions on peat substrates of the Rhynchosporion (7150)

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

The physical structure and distribution of the habitat across large sections of the high bog makes the process of calculating its area unfeasible and as a consequence makes the process of calculating realistic FRVs unfeasible. Thus, the assessment of the habitat's Area conservation status is indirectly

based on the assessment of Active Raised Bog habitat Area (a favourable assessment indicates that all sub-marginal ecotope has turned Active Raised Bog). The habitat Area is given an **Unfavourable Bad** assessment.

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

The habitat's Area Future Prospects status is equally based on the Active Raised Bog Area Future Prospects status assessment and the Area Future Prospects trend is based on the trend expected for Active Raised Bog and sub-marginal ecotope in the following two reporting periods. Impacting activities such as peat cutting, drainage on the high bog and cutovers, and the spread of invasive species are threatening Active and Degraded Raised Bog. Logically this has to have a long term negative effect on Rhynchosporion depressions. Therefore, the habitat's Area Future Prospects are given an **Unfavourable Bad-Decreasing** assessment.

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

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

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

The conservation status of depressions on peat substrates of the Rhynchosporion at Moanveanlagh 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	71.62	4.59	93.59	2.30	0.17	92.61

[1] 1994 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.

	FRV Target (ha) [5]	2012 value (ha) [6]	% above target	FRV 2012 Target (ha) [7]	2012 value (ha) [8]	% above target
7120	46.55	113.58	144.00	28.10	35.81	27.46

[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 Bad-Stable	Unfavourable Bad-Declining	Unfavourable Bad-Declining
7120	Unfavourable Bad-Decreasing	Unfavourable Bad-Stable	Unfavourable Bad-Declining	Unfavourable Bad-Declining
7150	Unfavourable Bad-Stable	Unfavourable Bad-Stable	Unfavourable Bad-Declining	Unfavourable Bad-Declining

Conclusions

Summary of impacting activities

- Peat cutting continues at the site and has taken place at 24 locations in the period 2004/5-2012. Information from the NPWS indicates an approximate 24 plots cut in 2012 and 22 in 2013. Over 0.75ha of high bog have been lost due to peat cutting in this period. This activity has directly diminished the extent of both marginal and face bank ecotopes and thus is considered to have had a high importance on Degraded Raised Bog. No variation in Active Raised Bog has taken place in the reporting period and thus peat cutting has been given a low importance/impact on Active Raised Bog and Rhynchosporion depressions.

- The current Active Raised Bog at the site, which only covers 3.88% of the high bog (4.59ha), is mostly confined to a depression on the bog (**C1** and **Sc1**), and corresponds with a major peat slippage/bog burst area believed to have resulted from a slump caused by peat cutting and associated drainage (Kelly *et al*., 1995). No cutting has occurred in this area in recent years but the presence of a wide cutover zone in this area means that extensive cutting occurred here in the past. Similar smaller slippage/burst areas are found in different locations across the high bog thus indicating that the stability of this bog is particularly susceptible to turf cutting. It is critical that no further cutting take place which could give rise to such occurrences. The other 3 sub-central areas (**Sc2, 3** and **4**) are associated with surface depressions and indicate potential vertical losses of water through the bog to the base of the bog or the underlying mineral soils, are likely to be a significant problem for the restoration of this bog. It is clear that turf cutting and drainage of the cutaway would exacerbate these effects.
- 1.14km of drains on the high bog remain functional, while another 0.37km are reduced-functional. Most of these are associated with the cutaways in the east, south and west of the high bog.
- Cutover drainage (peripheral drainage) associated with either currently active or no longer active peat cutting continues to impact on the high bog habitats. In addition, maintenance works have probably been carried out on drains in adjacent cutover and agriculture land during the reporting period. This impact was observed and assessed as having a high intensity by Fernandez *et al*. (2005), so is likely to have continued.
- No fire events have damaged the high bog in the reporting period, although burn events have regularly occurred in relatively recent times. Fernandez *et al*. (2005) included reference to significant burn events in the early 1980's, the period 1987-1992, 1993, and another in the period 1995-2000.
- The spread of the invasive *Sarracenia purpurea* is the basis for recording invasive species as an impact (albeit one of low importance) at the site. The recent expansion of the species at the site is illustrated by the reference by Douglas and Grogan (1987) to only one large stand in the southeast of the bog. The species is now widespread throughout the site, with occasional large stands over much of the high bog. Only in the most northerly sections of the high bog does it become relatively infrequent.
- There are conifer plantations in two locations on the cutover to the east of high bog, one of 2.4ha, and the other 3.4ha. The impact of such plantations is difficult to quantify with

certainty, but they are isolated from the high bog by a substantial expanse of cutover and are regarded as having a low impact.

Changes in active peat forming areas

- There has been no change in the total area of Active Raised Bog at Moanveanlagh Bog in the 2005 to 2012 period. However, the mapped distribution of habitats has changed in several ways, although all such changes are attributed to the more comprehensive mapping exercise employed in the current survey. A small area of central ecotope (**C1**), which was not previously identified at the site, has now been mapped in the southwest of the high bog. Active Raised Bog at the site had formerly been all classified as sub-central ecotope.
- Two new peat forming areas have been described at the site, in the form of two small patches of sub-central ecotope (**Sc3** and **Sc4)**, although these, like the central **C1**, are thought to be the result of more comprehensive field mapping rather than actual changes.
- The sub-central **Sc1** area has been altered, both by the re-classification of some habitat within its former boundary to central ecotope (**C1**, see above), and also by modifications to its boundary through more intensive surveying. Minor changes to the boundary of the other previously known sub-central area **(Sc2**) have also resulted from a more comprehensive mapping of its boundary.

Other changes

- Numerous revisions of ecotope boundaries on the high bog have resulted from more comprehensive surveying, and differences in the interpretation of habitats. The latter point is particularly relevant to the marginal/sub-marginal boundary, where there was frequently a relatively wide transitional zone, in which much of the habitat could justifiably have been assigned to either ecotope. None of the mapped changes to this boundary are regarded as indicating real change.
- The boundaries of the inactive flushes, **Y** and **Z**, with adjacent marginal and sub-marginal ecotope have been slightly modified, also as a result of more comprehensive surveying.
- The spread of the invasive *Sarracenia purpurea*, which was clearly widespread on the high bog in 2005 (Fernandez *et al*., 2005), is likely to have continued in the reporting period.

Quadrats analysis

- Quadrat **Qsc1**: Greater cover of pools and *Sphagnum* pools in 2005; higher cover of low hummocks, *Sphagnum* hummocks and *S. capillifolium* in 2012. Total *Sphagnum* cover and

Calluna vulgaris cover greater in 2012. All differences likely due to minor difference in quadrat location.

All other 2012 quadrats were in new locations.

Restoration works

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

Summary of conservation status

- **Active Raised Bog** has been given an **Unfavourable Bad–Declining** conservation status at Moanveanlagh Bog. Habitat Area and quality (S&Fs) have remained unchanged in the reporting period. However both of these assessment criteria are currently substantially below the FRVs. Future Prospects are considered Unfavourable Bad-Declining as impacting activities (peat cutting, drainage and the spread of invasive species) continue to threaten the habitat.

  It could be argued that the lack of a recent decrease in the area of Active Raised Bog means that turf cutting has not had a significant adverse impact on the bog in recent years. However, turf cutting and associated drainage has caused a major decrease in the area of uncut bog from 333 ha to 117ha of uncut bog and of active bog from 333 to 4.6 ha. Even after restoration works and a long recovery period the best that can be achieved is less than 20 ha of Active Raised Bog. Hence indicating that peat cutting has already had a serious negative impact over a long period at this site and its continuation prevents the recovery of the high bog, and the recovery of Active Raised Bog towards FRV's. In addition, restoration works cannot be employed until peat cutting stops.

  Turf cutting has the potential to instigate instability and possibly a bog burst/peat slippage within the bog, as it has elsewhere in the bog. While this may give rise locally to suitable conditions for active bog formation it does so at the expense of increasing slopes in adjacent parts of the bog, and therefore their restoration potential, and decreasing the long term stability of the bog. The habitat's future in these restricted areas depends on the stability of the bog topography. If activities which encourage subsidence, such as cutting and drainage, are occurring this will further destabilise the topography of the bog and threaten the remnants of active bog. This is obviously a very unstable and undesirable situation.

- **Degraded Raised Bog** has been given an **Unfavourable Bad-Declining** conservation status at Moanveanlagh Bog. 0.75ha of the high bog have been lost to peat cutting in the 2004/05-2012 period. These correspond with marginal and face bank ecotope. Habitat's S&Fs have remained Stable. Habitat Area and S&Fs are above the FRV, which is deemed negative for this habitat as regards its conservation status. 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 Moanveanlagh Bog. Habitat Area and quality (S&F) are considered to be unchanged in the reporting period. However, Future Prospects are considered Unfavourable Bad-Declining as a result of threatening impacting activities.

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

Recommendations

- **Cessation of peat cutting is essential to reduce further damage to the bog and to allow successful restoration actions to commence.**
- **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, and these are mostly rather short.
- **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 west and east, as the cutover is more extensive there. This may be particularly important as reaching the Active Raised Bog target on the high bog alone may not be achievable.
- **Further studies** to assess the actual impact on high bog habitats of conifer plantations in cutaway to the east of the site, and investigate the potential to restore any future clearfell areas to Active Raised Bog.
- **Further hydrological and topographical studies** to ascertain the capacity of the high bog to support Active Raised Bog and thus estimate a more accurate favourable reference value.
- **Further botanical monitoring surveys** on the high bog in order to assess changes in the conservation status of habitats, and potential monitoring surveys of cutover areas if they become part of future restoration programmes at the site.

- **A targeted program to eliminate or greatly reduce the rapidly expanding population of the alien invasive** *Sarracenia purpurea* should commence as soon as possible.

References

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Kelly, L., Doak, M. and Dromey, M. 1995. *Raised Bog Restoration Project: An Investigation into the Conservation and Restoration of Selected Raised Bog Sites in Ireland*. Unpublished report, National Parks & Wildlife, Department of Environment, Heritage and Local Government, Dublin.

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Appendix I Detailed vegetation description of the high bog

Active Raised Bog (7110)

Central Ecotope Complex

COMPLEX 15

- **Location**: mid-western part of the high bog, characterising **C1**
- **Ground**: very soft to quaking
- **Physical indicators**: absent
- ***Calluna* height**: 11-25cm
- ***Cladonia* cover**: <1%
- **Macro-topography**: depression
- **Pools**: interconnecting, 20%
- ***Sphagnum* cover**: 76-90%
- ***Narthecium* cover**: 5-10%
- **Micro-topography:** low hummocks/hollows/pools/lawns
- **Tussocks:** no
- **Degradation or regeneration evidence**: no
- **Species cover**: *Sphagnum capillifolium* (34-50%), *S. cuspidatum* (11-20%), *S. papillosum* (26-33%), *S. tenellum* (1-4%), *S. austinii* (1-4%), *S. fuscum* (1-4%), *Calluna vulgaris* (5-10%), *Erica tetralix* (5-10%), *Rhynchospora alba* (1-4%), *Eriophorum angustifolium* (1-4%), *Drosera anglica* (<1%), *Menyanthes trifoliata* (<1%), *Campylopus atrovirens* (<1%), *Sarracenia purpurea* (<1%).
- **Additional comments**: The interpool areas in this complex were very wet, and dominated by *Sphagnum* species with a very high total cover. Low hummocks in this area were mostly composed of *S. capillifolium. Campylopus flexuosus* was found in the complex and was found occasionally throughout the site. No central ecotope was mapped in the 2005 survey at Moanveanlagh Bog (Fernandez *et al*., 2005), so the area defined here by complex 15 (now designated **C1**) represents a change to the occurrence and distribution of ecotopes in the Active Raised Bog. However, **C1** is entirely within the area formerly designated as sub-central 1 (Sc1), so does not represent an addition to the total Active Raised Bog. This part of the site was not intensively surveyed in 2005, and the newly-mapped complex 15 is entirely within an area

where no mapping points were previously recorded. This change to the Active Raised Bog ecotope distribution may, therefore, be attributable to the greater mapping effort employed in the current survey.

Quadrat **Qc1** was carried out in this complex

Sub-Central Ecotope Complexes

COMPLEX 10/9

- **Location**: mid-western part of the high bog within **Sc3**
- **Ground**: very soft
- **Physical indicators**: absent
- ***Calluna* height**: 11-20cm
- ***Cladonia* cover**: 1-4%
- **Macro-topography**: a partial depression; also gentle slope to east
- **Pools**: regular, small, 5-10%
- ***Sphagnum* cover**: 51-75%
- ***Narthecium* cover**: 5-10%
- **Micro-topography:** low hummocks/hollows/lawns/pools
- **Tussocks:** *Trichophorum germanicum* (<1%); *Eriophorum vaginatum* (1-4%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Sphagnum capillifolium* (5-10%), *S. cuspidatum* (11-20%), *S. papillosum* (26-33%), *S. tenellum* (1-4%), *S. austinii* (1-4%), *S. fuscum* (<1%), *Eriophorum vaginatum* (11-25%), *E. angustifolium* (5-10%), *Rhynchospora alba* (5-10%), *Calluna vulgaris* (11-25%), *Erica tetralix* (1-4%), *Narthecium ossifragum* (5-10%), *Myrica gale* (1-4%), *Sarracenia purpurea* (1-4%).
- **Additional comments**: The microtopography in this complex was generally poorly developed, with only low hummocks of *S. capillifolium* and *S. papillosum*, and a patchy cover of pools, with mostly *S. cuspidatum* in pools and *S. papillosum* at pool edges. *Eriophorum* species were common throughout, and this, together with the very high *Sphagnum* cover, characterized the complex.

Quadrat **Qsc3** was carried out in this complex

COMPLEX 9/10

- **Location**: south-east part of the site, within **Sc2**
- **Ground**: very soft to quaking
- **Physical indicators**: absent

- ***Calluna* height**: 21-40cm
- ***Cladonia* cover**: absent
- **Macro-topography**: small depression
- **Pools**: interconnecting, 11-25% cover
- ***Sphagnum* cover**: 76-90%
- ***Narthecium* cover**: 1-4
- **Micro-topography:** low hummocks/hollows/pools/lawns
- **Tussocks:** absent
- **Degradation or regeneration evidence**: no
- **Species cover**: *Sphagnum capillifolium* (34-50%), *S. cuspidatum* (5-10%), *S. papillosum* (26-33%), *S. tenellum* (1-4%), *Calluna vulgaris* (5-10%), *Eriophorum vaginatum* (11-25%), *E. angustifolium* (1-4%), *Trichophorum germanicum* (1-4%), *Sarracenia purpurea* (11-25%).
- **Additional comments**: Pools had a generally high cover of *S. cuspidatum*, with *S. papillosum* very common around pool edges. Complex 9/10 defined the sub-central 2 area (**Sc2**) in the south end of the high bog. This area was similarly described in the 2005 survey of Moanveanlagh Bog (Fernandez *et al*., 2005), although a small portion of the former area was excluded this time and reference in the earlier report to *S. cuspidatum* lawns with 50% cover are at odds with the current description. The pools were mostly concentrated in the northern part of the mapped area, with the southern end tending towards a transition with the adjacent sub-marginal ecotope.

Quadrat **Qsc2** was carried out in this complex

COMPLEX 4/10

- **Location**: north central part of site, within **Sc4**
- **Ground**: very soft and very wet
- **Physical indicators**: absent
- ***Calluna* height**: 11-20cm
- ***Cladonia* cover**: absent
- **Macro-topography**: depression
- **Pools**: 1-4%
- ***Sphagnum* cover**: 51-75%
- ***Narthecium* cover**: 1-4%
- **Micro- topography**: Low hummocks/hollows & lawns
- **Tussocks**: absent

- **Degradation or regeneration evidence**: absent
- **Species cover**: *Rhynchospora alba* (34-50%), *Calluna vulgaris* (11-25%), *Erica tetralix* (4-10%), *Eriophorum angustifolium* (4-10%), *E. vaginatum* (1-4%), *Sarracenia purpurea* (1-4%), *Sphagnum capillifolium* (H; 4-10%), *S. papillosum* (H & L; 11-25%), *S. magellanicum* (L; 4-10%), *S. fuscum* (H; 1-4%), *S. austinii* (H; 1-4%), *S. cuspidatum* (L; 11-25%).
- **Additional comments:** Where the *Sphagnum* cover decreases this complex grades into the sub-marginal complex 9/7/4, and although 4/10 was mapped in only one small area there are pockets of it (too small to map) within the sub-marginal ecotope.

COMPLEX 6/4+P

- **Location**: south east part of high bog, characterising **Sc1**
- **Ground**: soft to very soft
- **Physical indicators**: bare peat 1-4%; some occasional dead stems of *Calluna* or *Myrica gale* may be from old burn, but no recent damage
- ***Calluna* height**: 11-20cm
- ***Cladonia* cover**: 1-4%
- **Macro-topography**: slope to north and east
- **Pools**: 5-10%
- ***Sphagnum* cover**: 34-50% (≤40%)
- ***Narthecium* cover**: 11-25%
- **Micro-topography:** high hummocks/low hummocks/hollows/pools
- **Tussocks:** absent
- **Degradation or regeneration evidence**: no
- **Species cover**: *Sphagnum capillifolium* (11-25%), *S. papillosum* (1-4%), *S. denticulatum* (<1%), *S. tenellum* (1-4%), *S. magellanicum* (1-4%), *Calluna vulgaris* (11-25%), *Rhynchospora alba* (11-25%), *Narthecium ossifragum* (11-25%), *Eriophorum vaginatum* (5-10%; c. 10%), *Erica tetralix* (1-4%).
- **Additional comments**: *Pleurozia purpurea* and *Campylopus atrovirens* were both present in this complex, although only rarely, at pool edges.
    - Variant 1: 6/9+P: Part of this complex (in Sc1) had a lower cover of *Rhynchospora alba* and correspondingly higher cover of *Eriophorum vaginatum* and was mapped as 6/9+P. However, as this represented only a very small area, with just a few mapping points in the west side of Sc1, it was treated as a variant of 6/4+P, rather than given a full separate description.

Quadrat **Qsc1** was carried out in this complex

Degraded Raised Bog (7120)

Sub-Marginal Ecotope Complexes

COMPLEX 9/7/4

- **Location**: northern part of the high bog
- **Ground**: very soft and very wet
- **Physical indicators**: absent
- ***Calluna* height**: 11-20cm
- ***Cladonia* cover**: 1-4%
- **Macro-topography**: gentle slope/possibly slight depression
- **Pools**: absent
- ***Sphagnum* cover**: 34-50%
- ***Narthecium* cover**: <4%
- **Micro-topography**: Low hummocks/hollows/high hummocks
- **Tussocks**: *Trichophorum germanicum* (4-10%; <4% in places)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (11-25%), *Erica tetralix* (<4%), *Eriophorum vaginatum* (4-10%), *E. angustifolium* (<4%), *Narthecium ossifragum* (<4%), *Rhynchospora alba* (26-33%), *Carex panicea* (<4%), *Sarracenia purpurea* (<4%), *Sphagnum capillifolium* (H; 26-33%), *S. papillosum* (H; 4-10%; 11-25% in places), *S. cuspidatum* (P; <4%), *S. austinii* (1-4%), Myrica gale (1-4%; 5-10% in places).
- **Additional comments:** this complex grades into the sub-central complex 4/10 where the cover of *Rhynchospora alba*, *Eriophorum angustifolium* and *Sphagnum* increases and there are lawns of *S. cuspidatum* and/or *S. magellanicum* present. Indeed pockets of 4/10 that were considered too small to map occur within this complex. Elsewhere in the complex, there is a gradation into the similar sub-marginal 9/7/6 complex, which tended to be drier and had a lower cover of *Sphagnum*. Some parts of 9/7/4 were quite wet, without having a very high *Sphagnum* cover. This, together with the occurrence of *Myrica* gale may suggest a degree of flushing through the zone.

COMPLEX 9/7/6

- **Location**: this is the most common sub-marginal ecotope community complex at the site and it is found across the entire high bog
- **Ground**: soft

- **Physical indicators**: absent
- ***Calluna* height**: 11-20cm
- ***Cladonia* cover**: 5-10%
- **Macro-topography**: gentle slope to South east
- **Pools**: absent
- ***Sphagnum* cover**: 11-25% (up to 26-33% in places)
- ***Narthecium* cover**: 11-25%
- **Micro-topography:** high hummocks/low hummocks/hollows
- **Tussocks:** absent
- **Degradation or regeneration evidence**: no
- **Species cover**: *Sphagnum capillifolium* (11-25%), *S. cuspidatum* (1-4%), *S. papillosum* (1-4%), *S. tenellum* (1-4%), *S. fuscum* (<1%), *S. austinii* (<1%), *Narthecium ossifragum* (11-25%), *Carex panicea* (5-10%), *Eriophorum vaginatum* (11-25%), *Erica tetralix* (5-10%), *Rhynchospora alba* (1-4%), *Sarracenia purpurea* (1-4%).
- **Additional comments**: The invasive *Sarracenia purpurea* was present at low frequency over much of this complex. There were occasional high hummocks of tall *Calluna vulgaris*, with species such as *Dicranum scoparium*, *Hylocomium splendens*, *Hypnum jutlandicum* and *Pleurozium schreberi*. Small *Racomitrium lanuginosum* hummocks were occasional. *Campylopus flexuosus* was common in this sub-marginal complex. The cover of *Carex panicea* varied somewhat in this complex, and was occasionally high enough to potentially indicate a separate community complex (e.g. 9/7/3). However, these areas were small and isolated and were therefore retained in the 9/7/6 complex.
  - Variant 1: 9/7/6+My (Myrica): this variant of 9/7/6 was present over much of the site and was particularly common in the northeast of the site, adjacent to Flush Z, where the sub-marginal ecotope vegetation showed elements of transition to flush.

Marginal Ecotope Complexes

COMPLEX 3/6

- **Location**: this is the most common marginal ecotope community complex at the site and it is found across the entire high bog margin
- **Ground**: firm
- **Physical indicators**: bare peat 2%
- ***Calluna* height**: 21-40cm

- ***Cladonia* cover**: 26-33%
- **Macro-topography**: moderate slope to SE (bog margin)
- **Pools**: 1-4%, tear pools/erosion channels
- ***Sphagnum* cover**: 10%
- ***Narthecium* cover**: 11-25%
- **Micro-topography:** low hummocks/hollows
- **Tussocks:** *Trichophorum germanicum* 1-4%
- **Degradation or regeneration evidence**: no
- **Species cover**: *Sphagnum capillifolium* (4-10%), *S. cuspidatum* (1-4%), *S. papillosum* (1-4%), *S. tenellum* (1-4%), *Calluna vulgaris* (26-33%), *Rhynchospora alba* (1-4%), *Eriophorum vaginatum* (4-10%), *Erica tetralix* (5-10%), *Trichophorum germanicum* (1-4%).
- **Additional comments**: A number of variants of 3/6 were described in the present survey, generally when some elements of the marginal ecotope differed from 3/6 in a single, though significant, way:
  - Variant 1: 3/6/2: this variant of 3/6 reflected the presence of *Trichophorum germanicum* tussocks, with a cover of 5-10%, in marginal ecotope that was otherwise not significantly different from 3/6, including an area along the east side of the site, where hummocks of *Racomitrium lanuginosum* and *Leucobryum glaucum* were also noted.
  - Variant 2: 3/6+My (Myrica): this complex differed significantly from 3/6 only in that *Myrica gale* formed a significant element of the vegetation.
  - Variant 3: 3/6+TP (Tear pools): the description of complex 3/6 (above) includes a cover value of 1-4% for tear pools (and erosion channels). This mostly refers to parts that were labelled as 3/6+TP (tear pools) to differentiate them from the parts of this complex that lacked such pools.
  - The boundary between marginal and sub-marginal ecotopes in the south-eastern part of the site differed from the 2005 survey (Fernandez *et al*., 2005), in that the current mapping exercise depicts a greater amount of marginal ecotope relative to the adjacent sub-marginal ecotope than was previously the case. However, the difference may be attributable to the greater mapping effort effected during the present survey, and the existence of a particularly wide transitional zone, where much of the habitat was not distinctly representative of either ecotope, and could justifiably have been assigned to either. The same observations apply to the north-eastern part of the site, where the current map depicts a wider sub-marginal zone, relative to the adjacent marginal zone.

Inactive flushes

FLUSH Y

- **Location**: north-west part of the high bog
- **Ground**: firm to soft
- **Physical indicators**: absent
- ***Calluna* height**: 21-30cm
- ***Cladonia* cover**: absent
- **Macro-topography**: steep slope
- **Pools**: absent
- ***Sphagnum* cover**: 11-25%
- ***Narthecium* cover**: absent
- **Micro-topography**: Not Applicable
- **Tussocks**: *Molinia caerulea* (51-75%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Molinia caerulea* (51-75%), *Calluna vulgaris* (11-25%), *Erica tetralix* (<4%), *Myrica gale* (<4%), *Carex panicea* (<4%), *Potentilla erecta* (<4%), *Polygala serpyllifolia* (<4%), *Sphagnum capillifolium* (H; 11-25%), *S. papillosum* (H; <4%).
- **Additional comments:** There are a number of swallow holes surrounded by robust *Calluna vulgaris* and *Osmunda regalis* within this flush.

FLUSH Z

- **Location**: north-east corner of the high bog
- **Ground**: firm
- **Physical indicators**: absent
- ***Calluna* height**: >60cm
- ***Cladonia* cover**: 5-10% (c. 5%)
- **Macro-topography**: gentle slope to north east and east
- **Pools**: absent
- ***Sphagnum* cover**: 1-4%
- ***Narthecium* cover**: 1-4%
- **Micro-topography:** *Molinia* tussocks/low hummocks
- **Tussocks:** *Molinia caerulea* 20%; *Trichophorum germanicum* 1-4%
- **Degradation or regeneration evidence**: no

- **Species cover**: *Sphagnum capillifolium* (1-4%), *Molinia caerulea* (51-75%), *Myrica gale* (5-10%), *Potentilla erecta* (1-4%), *Cladonia portentosa* (5-10%), *Erica tetralix* (1-4%)
- **Additional comments**: this inactive flush was dominated by *Molinia caerulea*, which had a cover abundance of over 50% throughout the whole area. A stock-proof fence ran across the flush in a NW-SE direction, although there was no indication of grazing on the eastern side, and management practices appeared to be the same on either side of the fence.

In the south west of the site, a number of isolated inactive flush points were mapped, mostly indicating small hummocks with *Betula pubescens* (<1m tall) and/or tall *Calluna*, along with other species such as *Aulacomnium palustre* and *Dicranum scoparium*. Most of these hummocks were on, or beside, an old, narrow infilled drain (or possibly animal track) that has clearly caused water movement through the area and produced the flushed conditions. The mapping points were retained as individual points, rather than amalgamated into a larger flush, due to their isolated positions and the discontinuity of flush vegetation between them.

Flush X, to the northeast of Flush Y, was recorded in 2005 (Fernandez *et al.*, 2005), but was not mapped in the current project as it was considered too small. Species recorded here included *Rhododendron ponticum* (1.5-2.0m in height), *Calluna vulgaris*, *Potentilla erecta*, *Succisa pratensis*, *Molinia caerulea*, *Hylocomium splendens*, *Ulex europaeus* and *Juncus effusus*.

Face bank Complexes

COMPLEX 1

- **Location**: occasional on margin of high bog; mostly in south east
- **Ground**: firm
- **Physical indicators**: absent
- ***Calluna* height**: 41-60cm
- ***Cladonia* cover**: 26-33%
- **Macro-topography**: steep slope to bog margin
- **Pools**: absent
- ***Sphagnum* cover**: 1-4%
- ***Narthecium* cover**: absent
- **Micro-topography:** tall *Calluna vulgaris*
- **Tussocks:** absent
- **Degradation or regeneration evidence**: no

- **Species cover**: *Sphagnum capillifolium* (1-4%), *Calluna vulgaris* (76-90%), *Eriophorum vaginatum* (1-4%), *Trichophorum germanicum* (5-10%), *Hypnum jutlandicum* (1-4%).
- **Additional comments**: none

Depressions on peat substrates of the Rhynchosporion (7150)

The habitat occurs at Moanveanlagh Bog in both Active and Degraded Raised Bog, but is only found occasionally on degraded habitat. Only *Rhynchospora alba* was recorded in the 2012 survey at this site.

R. alba is found in all ecotopes in Moanveanlagh Bog, including: central ecotope (15); sub-central ecotope (10/9; 9/10; 4/10, 6/4+P; 6/9+P (variant of 6/4+P)); sub-marginal ecotope (9/7/4; 9/7/6; 9/7/6+My (variant of 9/7/6)), marginal ecotope (3/6) and face bank ecotope (1).

The species becomes very frequent within complexes 4/10 and 6/4+P (sub-central) and 9/7/4 (sub-marginal).

The species is always found associated with wet features such as *Sphagnum* pools, *Sphagnum* lawns and hollows, along with species such as *Sphagnum cuspidatum*, *S. papillosum* and *S. magellanicum*.

It was also found within *Narthecium ossifragum* dominated hollows in sub-marginal and marginal ecotope complexes, and in more degraded areas of the bog, particularly where tear pools or erosion channels were found.

Appendix II Photographical records

Photograph Number	Aspect	Type	Feature	Date
DSCF3589	NE	Overview	Qc1	10/10/2012
DSCF3588	NE	Overview	Qsc1	10/10/2012
DSCF3587	NE	Overview	Qsc2	10/10/2012
11102012123	NE	Overview	Qsc3	11/10/2012

Appendix III Quadrats

Ecotope type	**Central**	**Sub-central**	**Sub-central**	**Sub-central**
Complex Name	**15**	**6/4 + TP + My**	**6/4 + TP**	**10/9**
Quadrat Name	Qc1	Qsc1	Qsc1	Qsc3
Easting	103875.375	103828	103831.181	104150.684
Northing	134490.270	134377	134372.970	134584.675
Date	10/10/2012	22/03/2005	10/10/2012	11/10/2012
Firmness	Quaking	Na	Soft	Very soft
Burnt	No	No	No	No
Algae in hollows %	Absent	Absent	Absent	Absent
Algae in pools %	Absent	Absent	Absent	Absent
Bare peat %	Absent	1-3 (many indiv)	4-10	Absent
High hummocks %	Absent	Na	Absent	Absent
Low hummocks %	34-50	4-10	34-50	34-50
Hollows %	4-10	4-10	4-10	4-10
Lawns %	4-10	Absent	1-3 (several indiv)	11-25
Pools %	26-33	11-25	4-10	11-25
Pool type	Interconnecting	Tear	Tear	Interconnecting
S.austinii hum type	Active	Na	Absent	Active
S.austinii hum %	1-3 (many indiv)	Absent	Absent	26-33
S.austinii height(cm)	0-10	Na	Absent	11-20
S.fuscum hum type	Absent	Na	Absent	Absent
S.fuscum hum %	Absent	Absent	Absent	Absent
S.fuscum height(cm)	Absent	Na	Absent	Absent
Leucobryum glaucum	Absent	Absent	Absent	Absent

Ecotope type	**Central**	**Sub-central**	**Sub-central**	**Sub-central**
Complex Name	**15**	**6/4 + TP + My**	**6/4 + TP**	**10/9**
Trichophorum type	Flats	Absent	Flats	Tussocks
Trichophorum %	1-3 (few indiv)	Absent	1-3 (few indiv)	1-3 (few indiv)
S.magellanicum %	Absent	Absent	Absent	Absent
S.cuspidatum %	26-33	4-10	1-3 (few indiv)	11-25
S.papillosum %	11-25	4-10	1-3 (many indiv)	11-25
S.denticulatum %	1-3 (many indiv)	1-3 (many indiv)	Absent	Absent
S.capillifolium%	26-33	4-10	26-33	4-10
S.tenellum %	1-3 (many indiv)	Na	4-10	1-3 (many indiv)
S.subnitens %	Absent	Absent	Absent	Absent
R.fusca %	Absent	Absent	Absent	Absent
R.alba %	4-10	4-10	1-3 (many indiv)	4-10
N.ossifragum %	1-3 (few indiv)	11-25	11-25	1-3 (many indiv)
Sphag pools %	26-33	11-25	1-3 (few indiv)	11-25
Dominant pool Sphag	S.cuspidatum	Na		S.cuspidatum
Sphag lawns %	4-10	Absent	1-3 (several indiv)	11-25
Sphag humm %	34-50	4-10	34-50	34-50
Sphag holl %	1-3 (many indiv)	4-10	1-3 (many indiv)	4-10
Total Sphag %	76-90	11-25	34-50	76-90
Hummocks indicators	S.austinii	Na	Absent	S.austinii
Cladonia portent %	Absent	1-3 (many indiv)	1-3 (many indiv)	1-3 (several indiv)
Other Cladonia sp		Na	C. uncialis	C. uncialis.
C. panicea %	Absent	Na	1-3 (few indiv)	Absent
Calluna cover %	26-33	4-10	26-33	4-10
Calluna height(cm)	11-20	11-20	11-20	0-10
Other NotableSpecies	Menyanthes perfoliata, Drosera anglica		Myrica gale Campylopus (brevipilus ?)	Sarracinea purpurea, Eriophorum

Ecotope type	**Central**	**Sub-central**	**Sub-central**	**Sub-central**
Complex Name	**15**	**6/4 + TP + My**	**6/4 + TP**	**10/9**
				vaginatum 34-50
Other comment	Campylopus atrovirens and Sarracinea purpurea adjacent to quadrat		pools mostly open water	S. fuscum and Myrica gale adjacent to quadrat

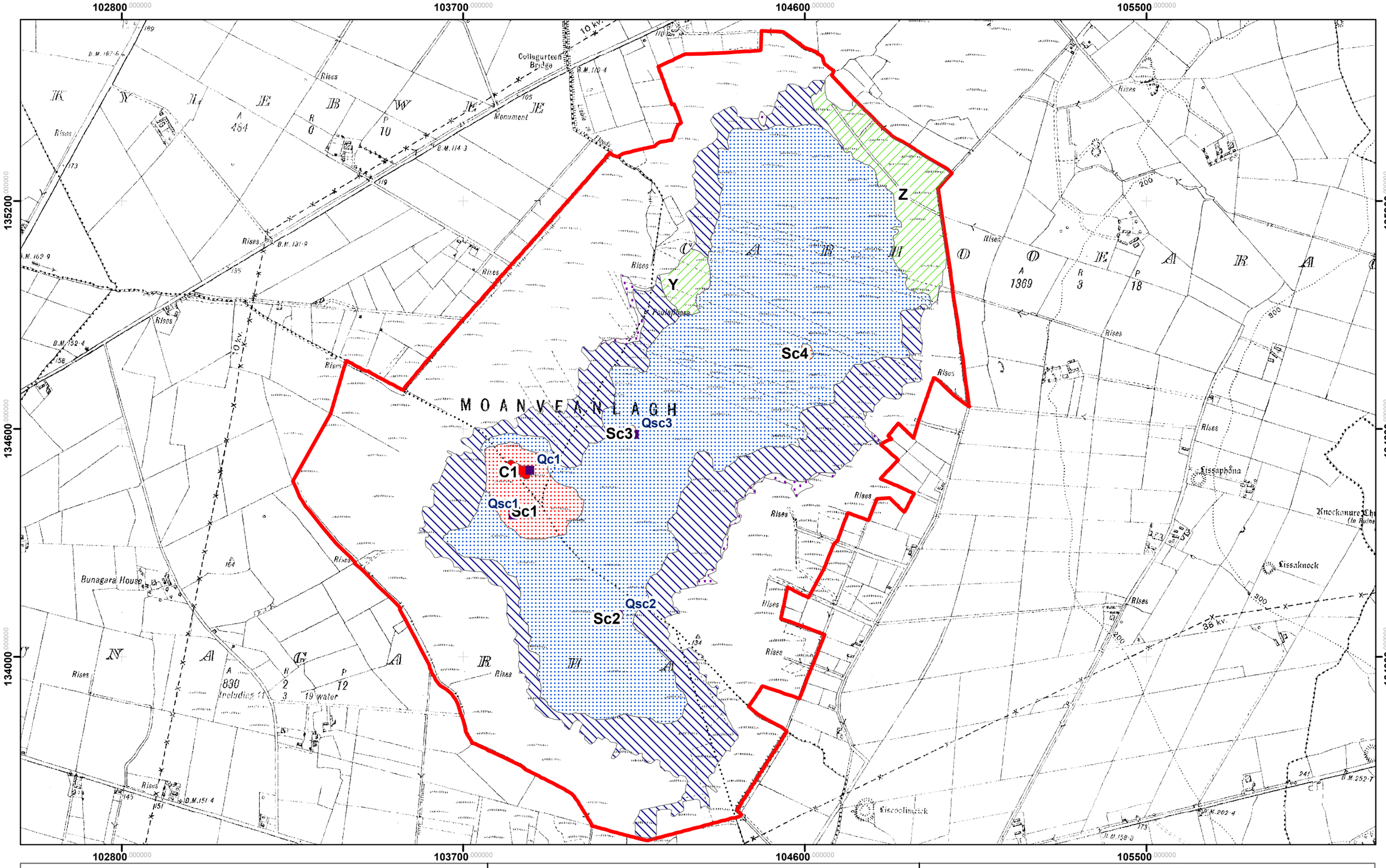
Ecotope type	**Sub-central**
Complex Name	**9/10**
Quadrat Name	Qsc2
Easting	104108.351
Northing	134109.973
Date	10/10/2012
Firmness	Very soft
Burnt	No
Algae in hollows %	Absent
Algae in pools %	Absent
Bare peat %	Absent
High hummocks %	Absent
Low hummocks %	34-50
Hollows %	4-10
Lawns %	4-10
Pools %	11-25
Pool type	Interconnecting
S.austinii hum type	Absent
S.austinii hum %	Absent
S.austinii height(cm)	Absent
S.fuscum hum type	Absent

Ecotope type	**Sub-central**
Complex Name	**9/10**
S.fuscum hum %	Absent
S.fuscum height(cm)	Absent
Leucobryum glaucum	Absent
Trichophorum type	Absent
Trichophorum %	Absent
S.magellanicum %	Absent
S.cuspidatum %	11-25
S.papillosum %	11-25
S.denticulatum %	1-3 (many indiv)
S.capillifolium%	26-33
S.tenellum %	1-3 (many indiv)
S.subnitens %	Absent
R.fusca %	Absent
R.alba %	1-3 (several indiv)
N.ossifragum %	4-10
Sphag pools %	4-10
Dominant pool Sphag	S.cuspidatum
Sphag lawns %	4-10
Sphag humm %	34-50
Sphag holl %	4-10
Total Sphag %	76-90
Hummocks indicators	Absent
Cladonia portent %	1-3 (many indiv)
Other Cladonia sp	C. uncialis
C. panicea %	Absent
Calluna cover %	26-33

Ecotope type	**Sub-central**
Complex Name	**9/10**
Calluna height(cm)	11-20
Other NotableSpecies	Sarracinea purpurea 20 % Eriophorum vaginatum 25%
Other comment	

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

Ecology and Environmental Consultants Ireland Ltd.

Moanveanlagh SAC (002351)
Co. Kerry

1:9,500

N

0 115 230 460 690 920 Meters

Legend

- Quadrat

Ecotope type

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

Raised Bog Monitoring & Assessment Survey 2013

Map 2: Vegetation community complexes

Ecology and Environmental Consultants Ireland Ltd.

Moanveanlagh SAC (002351)
Co. Kerry

1:9,500

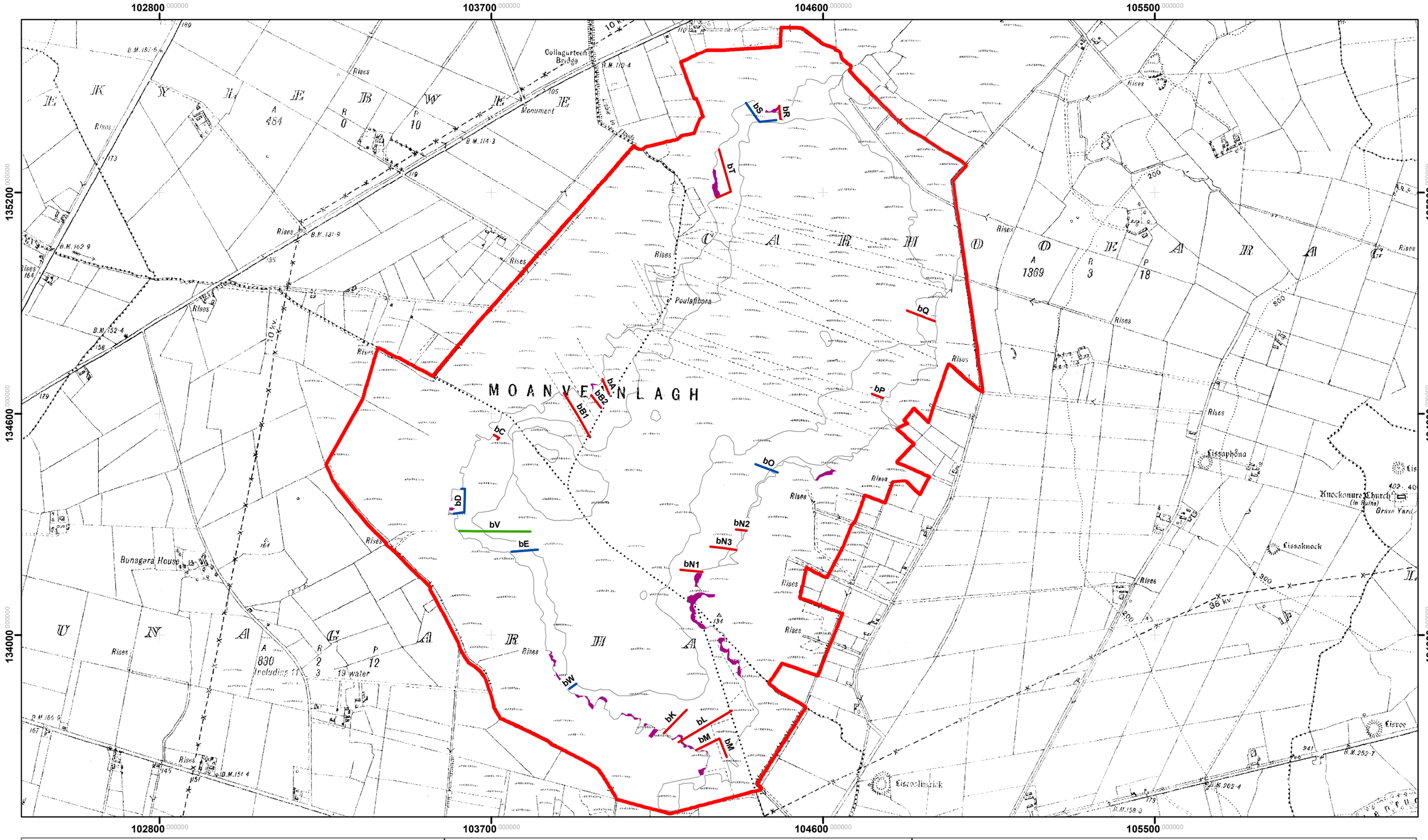
N

0 137.5 275 550 825 1,100 Meters

Legend

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

Boundary type
- Flush
- SC/C
- F/C
- SM/C
- M/C
- F/SC
- SM/SC
- M/SC
- FB/SC
- F/SM
- M/SM
- SM/FB
- F/M
- M/FB
- F/FB
- Other
- SAC



Raised Bog Monitoring & Assessment Survey 2013

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

Ecology and Environmental Consultants Ireland Ltd.

Moanveanlagh SAC (002351)
Co. Kerry

1:9,500

N

0 120 240 480 720 960 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