Killyconny Bog (SAC 000006), Co. Meath & Cavan

Executive Summary

This survey, carried out in October 2011, aimed to assess the conservation status of habitats listed on Annex I of the European Habitats Directive (92/43EEC) on the high bog at Killyconny 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 3.91ha (4.71%) of the high bog area. The highest quality example of Active Raised Bog consists of central ecotope in a small depression featuring *Sphagnum* hummocks, pools and hollows. *Sphagnum* cover ranges from 51 to 75% within this depression. This example of central ecotope was described as borderline central/sub-central ecotope. Most of the Active Raised Bog at the site consists of sub-central ecotope, where pools are generally absent.

Degraded Raised Bog covers 79.13ha (95.29%) of the high bog area. It is drier than Active Raised Bog and supports a lower density of *Sphagnum* mosses. It has a less developed micro-topography while permanent pools and *Sphagnum* lawns are generally absent.

Depressions on peat substrates of the Rhynchosporion are 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.

Restoration works took place at the site between 2006-10 including the blocking of some high bog drains and drains on the western and northern cutover, the grading of face banks and the installation of bund/seal parallel to a bog road. Coillte also removed the conifer plantation on the southwest cutover during this period.

The current conservation objective for Killyconny 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 45.53ha. The objective in relation to Structure and Functions (S&Fs) is that at least half of the Active Raised Bog area should be made up of the central ecotope and active flush (i.e. the wetter vegetation communities). These values have been set as Favourable Reference Values or FRVs until more site specific values can be set based on hydrological and topographical studies. The objective for Degraded Raised Bog is for the sub-marginal area to be restored to active peat forming communities as stated above and that no loss or degradation of any kind occurs. Although FRVs could not be established for the Rhynchosporion depressions, the objectives are to increase its extent and improve its quality to values associated with a favourable conservation status of Active Raised Bog. Therefore, the habitat's objectives are indirectly associated with Active Raised Bog objectives.

There has been no change in the Area or in the S&Fs of Active Raised Bog at Killyconny Bog in the 2004 to 2011 period. However, Degraded Raised Bog S&Fs have improved (i.e. sub-marginal increased by 5ha) as a result of re-wetting associated with the restoration works. Two new peat forming areas have been described at the site, but these are the result of a more comprehensive survey in 2011, rather than any actual change.

Cutover drainage and some functional and reduced functional high bog drains are the highest impacting activities at the site. No fire events have affected the bog in the reporting period. Peat cutting no longer takes place at the site. A few scattered pine trees remain on the high bog, but these do not pose a major threat to high bog habitats. A quarry was approx. 250m from the high bog within the northeast section of the SAC in 2010.

Active Raised Bog has been given an overall **Unfavourable Bad-Stable** conservation status assessment. Neither the habitat Area nor the habitat's S&Fs have changed in the reporting period and both values are below the FRVs. Future Prospects are considered Unfavourable Bad–Stable as a result of restoration works would have halted further habitats losses.

Degraded Raised Bog has been given an overall **Unfavourable Bad-Improving** assessment and **Rhynchosporion depressions** has been given an overall **Unfavourable Bad-Improving** conservation status assessment also as a result of restoration works.

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

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

Site identification

SAC Site Code	000006	**6" Sheet:**	CN44 & MH 10
Grid Reference:	E 268000 / N 282500	**1:50,000 Sheet:**	35
High Bog area (ha)	83.04ha		
Dates of Visit:	12/10/11		
Townlands:	Cloghbally Upper, Killyconny, Feegat, Leitrim and Fartragh		

Site location

Killyconny Bog is the most easterly raised bog site and lies approximately 2km south of Mullagh, Co. Cavan and 7.5km north-west of Kells, Co. Meath.

The site may be accessed from a road to the north which runs by Mullagh dump. This road runs along the whole west side of the bog and access may be obtained at number of points along the road.

Description of the survey

The survey was carried out in October 2011 and involved a vegetation survey of the high bog at Killyconny Bog and the recording of impacting activities affecting high bog vegetation. A similar survey was carried out in 2004 by Fernandez *et al*. (2005). High bog vegetation was described and mapped, based on raised bog ecotope vegetation community complexes developed by Kelly and Schouten (2002). Detailed notes were taken on each community complex and any flushed areas that were present. These included: species lists; estimation of % cover of dominant species; percentage *Sphagnum* cover; evidence of damage (due to burning, peat cutting or drainage); micro-topography; ground firmness; and presence of *Cladonia* species. A list of photographical records is given in Appendix II. The survey aimed to assess the conservation status of Habitats Directive (Council Directive 92/43/EEC) Annex I habitats on the high bog.

The entire high bog of Killyconny Bog was re-surveyed. Sections mapped as sub-marginal, sub-central and central ecotope in 2004 were surveyed in more detail. These are the areas where changes were likely to have occurred. Quadrats, which describe the micro-topographical features and

indicator species, recorded in the 2004 project (Fernandez *et al*. 2005) were re-surveyed and additional quadrats were recorded where necessary (see Appendix III). The size of quadrats was 4m x 4m.

The 2011 survey did not look at cutover. The survey of cutover would require a new methodology which would include assessments of cutover and lag zone vegetation, particularly to this site as restoration took place on cutover areas and improvements within these sections are expected.

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

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

Description of the high bog

The site is one of the most north-easterly raised bogs in the Republic of Ireland. It was designated as a SAC due to the unique geomorphological conditions under which it developed. This bog has been classified as a Ridge Basin bog type.

The site consists of a central area of raised bog which exists in two main lobes which are connected by a narrow strip of bog. The raised bog is surrounded to the north and west by cutover bog and to the south and east by a mosaic of cutover bog, scrub and rough grassland.

Ecological information

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

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

- Active Raised Bog (EU code 7110),
- Degraded Raised Bog (EU code 7120) and

- Depressions on peat substrates of the Rhynchosporion (EU code 7150).

Active Raised Bog (7110)

The current (2011) area of Active Raised Bog at Killyconny Bog is 3.91 ha (4.71% of the high bog), which is a decrease of 34.52ha since 1994.

Active Raised Bog includes central and sub-central ecotope.

Central ecotope was found in Killyconny at only one location (C1) and sub-central ecotope at six locations (Sc1 to Sc6) (see Appendix IV, Map 1). The highest quality Active Raised Bog sections consist of central ecotope (vegetation community complex 15) in a depressed area featuring hummocks, hollows and pools (34-50%). *Sphagnum* cover ranges from 51 to 75%, and consists of *Sphagnum capillifolium, S. austinii* and *S. fuscum*, *S. magellanicum* and *S. papillosum* hummocks and *S. cuspidatum* in pools along with *Drosera anglica*. The cover of *S. cuspidatum* is patchy in some pools and appears to be suffering from desiccation in places.

Complex 9/7/10 is the most widespread complex within sub-central ecotope and consists of low *S. capillifolium* hummocks and hollows with *S. cuspidatum* in places. Overall *Sphagnum* cover is greater than 50%, and reaches 75% in places. Other *Sphagnum* species include *S. papillosum*, *S. fuscum, S. magellanicum*, *S. tenellum*, and *S. subnitens*. Sub-central ecotope becomes wetter in other sections (e.g. community complex 9/7+P) where pools dominated by *S. cuspidatum* are found, but are rather small and contain high *Narthecium ossifragum* and *Rhynchospora alba* cover.

Degraded Raised Bog (7120)

The current area of Degraded Raised Bog at Killyconny Bog is 79.13ha (95.29% of the high bog).

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

The sub-marginal ecotope features the most developed micro-topography within Degraded Raised Bog, with higher presence of hummocks and hollows (frequently dominated by *Narthecium ossifragum* and only occasionally *Sphagnum cuspidatum* and *S. tenellum*). *Sphagnum* covers up to 33% of the ground and mostly consists of *S. capillifolium*. However, S*. papillosum, S. magellanicum, S. tenellum, S. subnitens* are also found forming hummocks and *S. cuspidatum* in hollows. Community complex 9/7/6 is the most widespread sub-marginal ecotope vegetation type on the site and is characterised by dominant *Calluna vulgaris, Erica tetralix* and *Narthecium ossifragum*. *Eriophorum*

vaginatum, E. angustifolium, Rhynchospora alba and *Trichophorum germanicum* are also common at various degrees of coverage.

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

Face bank ecotope is characterised by firm ground, tall *C. vulgaris*, poor *Sphagnum* cover and flat micro-topography. This ecotope is found at the edges of the high bog.

Depressions on peat substrates of the Rhynchosporion (7150)

Rhynchosporion vegetation is widespread on Killyconny Bog. It is found in both Active and Degraded Raised Bog, but tends to be best developed and most stable in the wettest areas of Active Raised Bog. In these areas, the Rhynchosporion vegetation occurs along pool edges and on lawns underlain by deep, wet and quaking peat. Typical plant species include *Rhynchospora alba, Sphagnum cuspidatum, S. magellanicum, S. papillosum, Drosera anglica* and *Eriophorum angustifolium*.

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

Detailed vegetation description of the high bog

A detailed description of high bog vegetation recorded during the 2011 survey of Killyconny 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 Killyconny 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) affected	Location	Habitat affected
C01	Quarrying	Unknown	-1	Unknown	Adjacent to HB	**7110/7120/7150**
J02.07	Drainage	M	-1	4.103km [1]	On HB	**7110/7120/7150**
J02.07	Drainage	M	-1	n/av	Adjacent to HB	**7110/7120/7150**
I01	Invasive alien species	L	-1	<0.1ha [3]	On HB	**7110/7120/7150**
B02.02	Forestry clearance	M	+1	9ha	Adjacent to HB	**7110/7120/7150**
4.2	Restoring/Improving the hydrological regime	M	+1	0.321km²	On HB	**7110**
4.2	Restoring/Improving the hydrological regime	H	+1	0.321km²	On HB	**7120/7150**
4.2	Restoring/Improving the hydrological regime	M	+1	6ha	Adjacent to HB	**7110**
4.2	Restoring/Improving the hydrological regime	H	+1	6ha	Adjacent to HB	**7120/7150**

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

[1] This figure only includes functional and reduced-functional drains (some of them blocked).

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

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

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

Peat cutting

Peat cutting no longer takes place at Killyconny Bog. Kelly *et al*., (1995) already stated that although peat cutting had ceased in recent years, there was active peat cutting, mainly using the hopper method, around most of the northern and western sides of the site and other areas had been cut in the past.

Currently, old face banks, high bog and cutover drainage associated with past cutting along the east and south sections of the site continue causing negative impacts on the high bog habitats.

Drainage

High bog drainage

The majority of drains in the high bog remain reduced functional and drain complex bG and drains bF and bH on the southern lobe remain functional (see Map 3). Drains bA and bB were blocked in the reporting period (2004-2011) and are now deemed reduced functional. However, some of the reduced functional drains are still impacting on high bog habitats and will continue to do so until they are blocked and become completely in-filled and thus non-functional.

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

Table 6.2 High bog drainage summary

Status	**2004 (km)** [1]	**2011 (km)**	**Change**
NB: functional	1.218	1.065	(-) 0.153
NB: reduced functional	2.885	2.885	0.000
NB: non- functional	0.737	0.737	0.000
B: functional	n/a	n/a	n/a
B: reduced functional	n/a	0.153	(+) 0.153
B: non- functional	0.168	0.168	0.000

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

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

Table 6.3 below provides a more detail description of the drainage present on the high bog at Killyconny Bog including any change in their functionality in the 2004 – 2011 reporting period (see Map 3).

Table 6.3 High bog drainage detail

Drain Name	Length (km)	2004 status	2011 status	Change	Comment
bA	0.070	NB: functional	B: reduced functional	Yes	Blocked with peat dams as part of a Restoration Programme between 2006-10. Infilling currently taking place
bB	0.083	NB: functional	B: reduced functional	Yes	Blocked using rigid plastic sheet dams as part of a Restoration Programme between 2006-10. These dams are not as efficient as the peat dams used in drains bA, as the low water levels within bB compared to bA indicates
bC	0.168	B: non-functional	B: non- functional	No	
bC	0.148	NB: non-functional	NB: non- functional	No	
bD	1.105	NB: reduced functional	NB: reduced functional	No	Infilling taking place
bD	0.390	NB: non-functional	NB: non- functional	No	
bF	0.116	NB: functional	NB: functional	No	
bG	0.748	NB: functional	NB: functional	No	
bH	0.201	NB: functional	NB: functional	No	
bJ1	1.521	NB: reduced functional	NB: reduced functional	No	Infilling taking place
bJ1	0.199	NB: non-	NB: non- functional	No	

		functional			
bJ2	0.076	NB: reduced functional	NB: reduced functional	No	Infilling taking place
bJ3	0.183	NB: reduced functional	NB: reduced functional	No	Infilling taking place

Bog margin drainage

The cutover areas were not surveyed for drains during 2011.

Cutover drains along the western and northern cutover have been blocked and dams built as part of the restoration project undertaken within the reporting period (2004-2011). A Coillte LIFE project was also carried out at the site. This included the removal of the conifer plantation on the cutover to the southwest of the site and the blocking of drains with peat dams.

However, drains to the east of the southern lobe remain functional and impacting on the high bog habitats. Furthermore, a major field drain was cleaned /deepened (2.5m deep and 3m wide) at Leitrim townland in late summer 2010 to the northeast of site (GR 283440/268567). Another landowner upstream from this took advantage of the improved outflow to carry out further drainage works (Mcdonagh pers. comm., 2011). The impact arising from these drainage maintenance works has not been estimated, but due to their proximity to the high bog some negative impact on the high bog habitats is expected. In addition, the southern cutover drains continue impacting on the high bog habitats.

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

Fire history

No evidence of fire events having taken place in 2004 – 2011 period were noted in the 2011 survey.

Invasive species

Some scattered trees were reported in 2004 by Fernandez *et al*. (2005) in the centre of the southern lobe (GR 267758, 282334). These trees were recorded again during the 2011 survey but not spreading.

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

Afforestation and forestry management

A mature forestry plantation of lodgepole pine (*Pinus contorta*) located to the SW of the southern lobe was mentioned by Fernandez *et al*. (2005). This conifer plantation has been removed in the reporting period. The removal is considered as having a positive influence on the high bog hydrology and thus on the high bog habitats.

Other impacting activities

A quarry was opened approx. 250m from the high bog within the northeast section of the SAC (GR 268770 / 282670) in 2010. The quarried stone was used to construct drains in the adjacent wet grassland (Mcdonagh pers. comm., 2011). The intensity and influence of this activity on the high bog habitats is unknown.

Conservation activities

A Restoration Project named "Ladybird Bog Restoration project" commenced in 2006 when a number of drains were blocked on the Trustee cutover at Cloghbally Upper/ Fartagh townlands. Each year since then further drains were blocked. A bund/seal was also installed parallel to the bog road as part of the works. In addition, the face bank was graded in an effort to slow water loss from the high bog. An experimental length of bund was also installed on the high bog 6m back from the face bank in 2009. There was no new project work during 2011 due to budget cutbacks. The restoration project's area extends from the edge of Coillte's Fartagh property north eastwards to a drain at N268380/283400. The roadside bund runs from the same starting point to GR 268010/283400. The face bank works extend from the Coillte property as far as GR 267960/283350 (Mcdonagh pers. comm., 2011). The project also involved the blocking of a couple of drains (bA and bB) on the high bog.

At the time of the 2011 survey, there was as yet no evidence of an expansion or an improvement in the quality of Active Raised Bog. However, the quality of Degraded Raised Bog has indeed shown an improvement with an approx. 5ha increase in the area of sub-marginal ecotope at the expense of marginal ecotope. This improvement was particularly evident along the western section of high bog where restoration works took place.

NPWS has also engaged in negotiation and agreements with landowners. Turbary rights and ownership rights of various turf-cutting plots around the bog have been bought, and this has

contributed to the fact that peat cutting no longer takes place at Killyconny Bog. Nonetheless some plots and turbary right remain in private ownership.

A Coillte LIFE project was also carried out at the site (see website for further detail: http://www.raisedbogrestoration.ie/life04/downloads/monitoring-report-killyconny-bog-cavan-ireland.pdf). This included the removal of the conifer plantation on the cutover to the southwest of the site and the blocking of drains with peat dams.

Both high bog and cutover drainage blocking are reported as positive management actions under Restoring/Improving the hydrological regime (4.2) within table 6.1. A high importance/impact on 7120 and 7150 habitats has been given as improvements on both habitats have taken place, whereas a medium importance/impact on 7110 habitat has been given, as no variation on its extent has been noted in the reporting period. Nevertheless, restoration works would have halted further habitat losses.

Conservation status assessment

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

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

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

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

Active Raised Bog (7110)

Area

Table 8.1 indicates that there has been no change in the area of Active Raised Bog in the reporting period (2004-2011).

Central ecotope area is considered not to have changed in the reporting period.

Two new areas of sub-central ecotope (**Sc5** and **Sc6**) have been mapped in 2011. These areas are also the result of a more comprehensive surveying in 2011, which also resulted in changes in **Sc1,** which is slightly smaller than mapped in 2004 and now consists of three isolated sub-central ecotope sections. Slight changes in the ecotope boundary have also been reported at **Sc2, Sc3** and **Sc4**, but these are also the result of a more comprehensive surveying and accurate mapping in 2011 (see Map 1).

Small pockets of sub-central ecotope (too small to be mapped) have been recorded during the 2011 survey to the south of **Sc1** and north of **Sc4** (see Map 2). Some of these small patches of sub-central ecotope were previously (2004) mapped as part of larger sub-central ecotope areas and now are only depicted as sub-central ecotope complexes dots.

The favourable reference value (FRV) for Area is considered to be the sum of Active Raised Bog (central, sub-central ecotopes and active flush) plus sub-marginal ecotope when the Habitats Directive came into force in 1994 (see table 8.4). Therefore, Active Raised Bog Area FRV is 45.53ha (based on 1994/95 Kelly *et al*. (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 (3.91ha) is 91.41% below the FRV. A current habitat Area value more than 15% below FRV falls into the **Unfavourable Bad** assessment category.

Active Raised Bog would not reach a favourable assessment until its Area reaches the FRV. The current characteristics of the high bog at Killyconny Bog (i.e. steep slopes caused by peat cutting and drainage) make the development of the targeted Active Raised Bog FRV on the high bog difficult to achieve. Thus, cutover and particularly the western cutover, where blocking of drains and the construction of dams has taken place, could play an essential role in the development and expansion of Active Raised Bog at the site.

Although a long term (1994/5-2011) trend indicates a reduction in the area of Active Raised Bog at the site (34.54ha) (see table 8.1). A more recent and short term trend analysis (7 years; 2004-2011) shows no change in its area. Therefore, the habitat Area is given a **Stable** trend assessment.

The Area of Active Raised Bog at Killyconny 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 1.96ha (half of 3.91ha, the current area of Active Raised Bog). The current value is 0.21ha which is 89.29% below the FRV. A current value more than 25% below FRV falls into the **Unfavourable Bad** assessment category.

Although a long term (1994/5-2011) trend indicates an increase in the area of central ecotope at the site (0.21ha) (see table 8.1). This could be due to vegetation interpretation. A more recent and short term trend analysis (7 years; 2004-2011) shows no change. Therefore, S&Fs are given a **Stable** trend assessment.

Quadrats analysis (**Qc1** &**Qsc1**) indicates the following:

Qc1: this quadrat was described as complex 14 (central ecotope) in 2004, but re-classified as complex 15 in 2011. This is the result of vegetation re-interpretation rather than any actual change. Small differences between the 2004 and 2011 data have been noted, as follows: absence of algae and *Cladonia* sp. in 2011; some bare peat being present in 2011; a slight decrease in pools cover; *Sphagnum austinii* absent in 2011 (but found within the complex); a slight decrease in the cover of *S. magellanicum* and *S. capillifolium*; *S. denticulatum* is absent in 2011 (this may be the result of a misidentification in 2004). However, these changes may also indicate a slight decline in habitat quality.

Qsc1: this complex has been re-classified as complex 9/7/10 (9/10 in 2004). Although the change in the quadrat name would indicate a decline in the habitat quality, it is more likely that the quadrat data has merely been interpreted differently. However, some small differences were recorded between the quadrats including a reduction in the cover of hollows; a slightly higher hummocks cover, slight decrease in *Sphagnum austinii, Trichophorum germanicum*, *Narthecium ossifragum* cover; a higher *S. papillosum* cover; *Sphagnum* pools absent in 2004 (this could be the result of observer variation as these features may have been considered hollows in 2004); *Cladonia* sp., not previously recorded. However, these changes may also indicate a slight decline in habitat quality.

Some of these changes noted within the above quadrats may be also the result of a potential discrepancy in the quadrat location (up to 2m) between both year surveys, rather than actual changes.

Typical good quality indicators and typical plant species are still found in sub-central and central ecotopes throughout the entire bog. No major changes of their occurrence within quadrats (**Qc1** & **Qsc1**) have taken place (see Appendix III).

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

Future Prospects

Although the habitat Area and S&Fs have not varied in the reporting period, evidence of Degraded Raised Bog recovery (i.e. expansion of sub-marginal ecotope) have been noted. This should be taken as an indication of the positive effects that the restoration works have had on the high bog. In addition, these restoration works would have halted further Active Raised Bog losses.

Habitat A**rea** is currently 91.41% below FRV (see table 8.4) and although improvements in Degraded Raised Bog may continue, no increase in Active Raised Bog are expected due to the topographical characteristics of the high bog (i.e. small size high bog and steep slopes caused by peat cutting and drainage). In addition, further subsidence and increases in slopes are likely to continue despite the cessation of peat cutting, as this activity was only recently stopped. Thus, a Stable trend is given to the habitat Area in the following two reporting periods (12 years). The habitat Area is expected to remain more than 15% below FRV. Thus, habitat's **Area Future Prospects** are assessed as **Unfavourable Bad - Stable**. Habitat's **S&Fs** are currently 89.29% below FRV (see table 8.4). A Stable trend is also foreseen, and therefore **S&Fs** are expected to be more than 25% below FRV in the following two reporting periods. Habitat's **S&Fs Future Prospects** are assessed as **Unfavourable Bad - Stable**.

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

Cutover areas (particularly the western and northern) will play a major role in the restoration of the habitat as the current characteristics of the high bog (i.e. small size, steep slopes caused by cutting and drainage) may make it difficult to regenerate previous Active Raised Bog values on the high bog.

Table 8.1 Changes in Active Raised Bog area

Active Ecotopes	1994/5 [1]	2004 [2]	2004 (amended)	2011	Change (2004-2011)	
	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	%
Central	0.00	0.23	0.21	0.21	0.00	0.00
Sub-central	38.43[3]	4.73	3.70	3.70	0.00	0.00
Total	**38.43**	**4.96**	**3.91**	**3.91**	**0.00**	**0.00**

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

[2] 2004 figures have been slightly modified based on a more accurately mapped high bog boundary undertaken as part of this project. This has mostly affected face bank ecotope figures.

[3] This figure includes 0.23ha of Active flush considered to be sub-central ecotope

Note: Table 8.1 includes 2004 figures and 2004 amended figures. The latter shows the ecotope area believed to be present in 2004 after surveying improvements in 2011. The comparison between 2004 (amended) and 2011 illustrates the actual changes in ecotope area in the 2004-2011 period. Any change in ecotope area between the 2004 and the 2004 (amended) values is due to improvement in mapping accuracy and/or the result of a more comprehensive survey in 2011 (see table 8.2 for further detail).

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

Table 8.2 Assessment of changes in individual Active Raised Bog areas

Area	Quadrats	Trend	Comment	Quadrats analysis
C1	Qc1	Stable (possibly declining)	Slightly smaller than mapped in 2004. This change is the result of more comprehensive surveying in 2011 which resulted in a more accurate mapping.	Qc1: absence of algae and *Cladonia* sp. in 2011; some bare peat present in 2011; a slight decrease in pools cover; *Sphagnum austinii* absent in 2011 (but found within the complex); a slight decrease in the cover of *S. magellanicum* and *S. capillifolium*; *S. denticulatum* absent in 2011 (this may be the result of a misidentification in 2004).
Sc1	None	Stable	Slightly smaller than mapped in 2004. Sc1 currently consists of three separated	

			sections. This change is likely to be the result of more comprehensive surveying in 2011 which resulted in more accurate mapping.	
Sc2	Qsc1	Stable	Slight changes in boundary. This change is the result of more comprehensive surveying in 2011 which resulted in more accurate mapping.	Qsc1: reduction in the cover of hollows, slightly higher hummocks cover, a slight variation in *Sphagnum austinii, Trichophorum germanicum*, *Narthecium ossifragum* cover; higher *S. papillosum* cover; *Sphagnum* pools absent in 2004 (these may have been classed as hollows in 2004).
Sc3	None	Stable	Slight changes in boundary. This change is the result of more comprehensive surveying in 2011 which resulted in more accurate mapping.	
Sc4	None	Stable	Slight changes in boundary. This change is the result of more comprehensive surveying in 2011 which resulted in more accurate mapping.	
Sc5	None	Unknown	This specific area was not surveyed in 2004. This is likely to be the result of more comprehensive surveying in 2011 which resulted in more accurate mapping.	
Sc6	None	Unknown	This specific area was not surveyed in 2004. This is likely to be the result of more comprehensive surveying in 2011 which resulted in more accurate mapping.	

Degraded Raised Bog (7120)

Area

The Degraded Raised Bog FRV for area is 37.51ha at Killyconny Bog. This value corresponds with the difference between the current high bog area (83.04ha) and the FRV of Active Raised Bog (45.53ha). 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 110.96% bigger than FRV and therefore the habitat Area is given an **Unfavourable Bad** assessment (see table 8.5).

Table 8.3 indicates that there has been no change in the area of Degraded Raised Bog. Therefore the habitat is given a **Stable** trend.

The Area of Degraded Raised Bog at Killyconny Bog is assessed as Unfavourable Bad-Stable (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 19.78ha (25% of 79.13ha, the current area of Degraded Raised Bog). The current marginal and face bank ecotopes area value (38.57ha) is 94.99% 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.

As table 8.3 indicates, the area of marginal ecotope has decreased and as a result sub-marginal has increased by approximately 5ha along the narrowest section of high bog linking both northern and southern lobes, as well as the north-western section of the southern lobe and the western section of northern lobe. This change is due to re-wetting associated with the restoration works undertaken in the reporting period. Any other change in the area of sub-marginal ecotope is considered to be the result of a more comprehensive surveying and accurate mapping in 2011. S&Fs trend is assessed based on actual changes within marginal and face banks ecotope (e.g. decreases due to rewetting processes or increases as a result of further drying out). Thus, the DRB's S&Fs at Killyconny are given an **Improving** trend.

The Structure & functions of Degraded Raised Bog at Killyconny Bog are assessed as Unfavourable Bad – Improving as a result of the decrease in marginal ecotope and increase in sub-marginal ecotope (see table 8.5).

Future Prospects

Restoration works 2004 have had a positive effect on the habitats S&Fs and are likely to continue to do so in the future, despite certain impacting activities (e.g. high bog and cutover drains) still negatively impacting the habitat. Habitat **Area** is currently 110.96% above FRV (see table 8.4) and a Stable trend is expected in the following two reporting periods (12 years). The habitat Area is expected to remain more than 15% above FRV. Thus, habitat **Area Future Prospects** are assessed as **Unfavourable Bad - Stable**. Habitat's **S&Fs** are currently 94.99% above FRV (see table 8.4). Although an Improving trend is foreseen in the following two reporting periods, **S&Fs** are expected to remain more than 25% above FRV. Thus, habitat's **S&Fs Future Prospects** are assessed as **Unfavourable Bad - Improving**.

The overall habitat's Future Prospects are Unfavourable Bad - Improving (see table 8.5)

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

Table 8.3 Changes in Degraded Raised Bog area

Inactive Ecotopes	**1994/5** [1]	**2004** [2]	**2004 (amended)**	**2011**	**Change (2004-2011)**	
	Area (ha)	**Area (ha)**	**Area (ha)**	**Area (ha)**	**Area (ha)**	**%**
Sub-marginal	7.1	30.01	35.56	40.56	(+)5.00	(+)14.06
Marginal	39.70	43.75	39.25	34.25	(-)5.00	(-)12.74
Face bank	Na	4.32	4.32	4.32	0.00	0.00
Total	**46.80**	**78.09**	**79.13**	**79.13**	**0.00**	**0.00**

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

[2] 2004 figures have been slightly modified based on a more accurately mapped high bog boundary undertaken as part of this project. This has mostly affected face bank ecotope figures.

Note: Table 8.3 includes 2004 figures and 2004 amended figures. The latter shows the ecotope area believed to be present in 2004 after surveying improvements in 2011. The comparison between 2004 (amended) and 2011 illustrates the actual changes in ecotope area in the 2004-2011 period. Any

change in ecotope area between the 2004 and the 2004 (amended) values is due to improvement in mapping accuracy and/or the result of a more comprehensive survey in 2011.

Depressions on peat substrates of the Rhynchosporion (7150)

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

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

The Area trend assessment is based on the variation on Active Raised Bog and sub-marginal ecotope within Degraded Raised Bog in the reporting period. The area of sub –marginal ecotope has slightly increased in the reporting period, whereas the Active Raised Bog area has remained unchanged. As a result the habitat Area is likely to have also increased. Thus, habitat Area is given an **Increasing** trend.

The habitat's Area Future Prospects status is equally based on the Active Raised Bog Area Future Prospects status assessment and the Area Future Prospects trend is based on the trend expected for Active Raised Bog and sub-marginal ecotope in the following two reporting periods. Restoration works are likely to continue positively affecting the habitat in the future despite the occurrence of certain activities (e.g. high bog and cutover drainage) still negatively impacting the associated habitats (i.e. Active and Degraded Raised Bog). Therefore, the habitat's Area Future Prospects are given an **Unfavourable Bad**-**Increasing** assessment.

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

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

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

Table 8.4 Habitats favourable reference values

Habitat	Area Assessment			Structure & Functions Assessment		
	FRV Target (ha) [1]	**2011 value (ha) [2]**	**% below target**	**FRV 2011 Target (ha) [3]**	**2011 value (ha) [4]**	**% below target**
7110	45.53	3.91	91.41	1.96	0.21	89.29

[1] 1994/95 central, sub-central, active flush, bog woodland and sub-marginal ecotope area.
[2] 2011 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] 2011 central ecotope and active flush area.

	FRV Target (ha) [5]	**2011 value (ha) [6]**	**% above target**	**FRV 2011 Target (ha) [7]**	**2011 value (ha) [8]**	**% above target**
7120	37.51	79.13	110.96	19.78	38.57	94.99

[5] 1994/95 high bog area minus 7110 area FRV.
[6] 2011 Degraded Raised Bog area.
[7] 25% of the current Degraded Raised Bog habitat area. The target is that the extent of marginal and face bank ecotopes should not be larger than 25% of the current Degraded Raised Bog habitat area.
[8] Current marginal and face bank ecotopes area.

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

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

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-Stable	Unfavourable Bad-Stable
7120	Unfavourable Bad-Stable	Unfavourable Bad-Improving	Unfavourable Bad-Improving	Unfavourable Bad-

				Improving
7150	Unfavourable Bad-Increasing	Unfavourable Bad-Stable	Unfavourable Bad-Improving	Unfavourable Bad-Improving

Conclusions

Summary of impacting activities

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

- Peat cutting is no longer present at the site. However, open face banks may still continue draining the high bog, particularly along the eastern and southern cutover where restoration works have not taken place.
- Only a few drains on the high bog remain functional (drain bG and bF complex to the south of high bog. Most remain reduced functional (drain complex bJ to the east). Drains bA and bB were blocked as part of the recent restoration project, but are still considered reduced functional.
- Cutover drainage (peripheral drainage) along the western and north cutover were also blocked. However, those along the eastern and southern cutover continue negatively impacting on high bog habitats. In addition, drains on adjacent agriculture land have been cleaned /deepened within the reporting period.
- No fire events have damaged the high bog in the reporting period.
- Invasive species (*Pinus* sp.) although present do not seem to have spread in the reporting period and are not considered a major threat.
- A quarry was opened within approx. 250m from the high bog within the northeast section of SAC.

Changes in active peat forming areas

- Two new peat forming areas (**Sc5** and **Sc6**) have been described at the site (see table 8.2). These new sub-central ecotope areas are the result of a more comprehensive survey in 2011 rather than any actual change.
- Overall, Active Raised Bog has not changed in the reporting period.

Quadrats analysis

- No major changes in vegetation have taken place within those quadrats recorded in 2004 that were re-surveyed in 2011 (see Appendix III).
- Although high accuracy GPS equipment was used during the 2004 and 2011 surveys, the devises still only allow up to 0.5m accuracy. Therefore, this possible discrepancy in the location of quadrats may justify certain differences in the vegetation described within quadrats. Permanent markers were inserted into quadrats recorded in 2011.

Restoration works

- Restoration works (blocking of high bog and cutover drains, a bund/seal installed parallel to the road and grading of face banks) in the 2006 to 2010 period have had a positive effect on the high bog vegetation as evidenced by the increase in sub-marginal (5ha) ecotope at the expense of marginal ecotope. However, no evidence of an improvement in Active Raised Bog has been noted. This restoration project will also encourage the development of Active Raised Bog on restored cutover areas (not surveyed in 2011).
- Restoration works also included the removal of the conifer plantation and the blocking of drains to the southwest of the high bog as part of a Coillte restoration project.

Summary of conservation status

- **Active Raised Bog** has been given an overall **Unfavourable Bad-Stable** conservation status at Killyconny Bog. Neither the habitat Area nor the habitat's S&Fs have changed in the reporting period and both values are below the FRVs. Future Prospects are considered Unfavourable Bad–Stable as a result of restoration works. Cutover areas may play a major role in the development of Active Raised Bog at Killyconny Bog as the high bog may not be able to support the targeted FRV due to its current characteristics (i.e. small size and steep slopes caused by peat cutting and drainage).
- **Degraded Raised Bog** has been given an overall **Unfavourable Bad-Improving** conservation status at Killyconny Bog. Habitat Area has not changed, but its S&Fs have improved (5ha increase in sub-marginal ecotope) in the reporting period. Future Prospects are considered Unfavourable Bad-Improving as a result of restoration works.
- **Depressions on peat substrates of the Rhynchosporion** has been given an overall **Unfavourable Bad-Improving** conservation status at Killyconny Bog. Habitat Area has increased associated with the expansion of sub-marginal ecotope and S&Fs remained stable in the reporting period. Future Prospects are considered Unfavourable Bad-Improving.

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

Recommendations

- **Further restoration works** including blocking of remaining high bog functional drains, and possibly reduced functional drains that have not already been blocked along the eastern high bog sections, as well as the remaining un-blocked cutover drains.
- **Further hydrological and topographical studies** to ascertain the capacity of the high bog to support Active Raised Bog and thus estimate a more accurate habitat Area favourable reference value.
- **Further botanical monitoring surveys** both on the high bog and cutover in order to assess the effectiveness of restoration works.
- **An Impact assessment** of maintenance works on adjacent land drainage.

References

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Fernandez, F., Fanning, M., McCorry, M. and Crowley, W. 2005. *Raised Bog Monitoring Project 2004-05*. Unpublished report, National Parks & Wildlife Service, Department of Environment, Heritage and Local Government, Dublin.

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

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

Appendix I Detailed vegetation description of the high bog

Active Raised Bog (7110)

Central Ecotope Complexes

COMPLEX 15

- **Location**: this complex characterises **C1**
- **Ground**: quaking
- **Physical indicators**: bare peat <4%
- ***Calluna* height**: 21-30cm
- ***Cladonia* cover**: absent
- **Macro-topography**: depression
- **Pools**: 34-50% (26-33% in places)
- ***Sphagnum* cover**: 51-75%
- ***Narthecium* cover**: 4-10%
- **Micro- topography**: High and low hummocks/hollows and pools
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (11-25%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (4-10%), *E. angustifolium* (26-33%), *Narthecium ossifragum* (4-10%), *Rhynchospora alba* (4-10%), *Drosera anglica* (<4%), *Andromeda polifolia* (<4%), *Vaccinium oxycoccos* (<4%), *Sphagnum capillifolium* (Hummocks (H); 11-25%), *S. austinii* (H; <4%), *S. fuscum* (H; <4%), *S. papillosum* (H & Pools (P); 4-10%), *S. magellanicum* (Lawns (L) & P; 4-10%), *S. cuspidatum* (P; 26-33%).
- **Additional comments**: The cover of *S. cuspidatum* is patchy in some pools and appears to be suffering from desiccation in places. **C1** is considered a borderline example of central ecotope.

Quadrat **Qc1** was recorded within this complex.

Sub-Central Ecotope Complexes

COMPLEX 9A/10

- **Location**: this complex dominates **Sc3**, but is also found within **Sc6**
- **Ground**: very soft
- **Physical indicators**: bare peat (<4%)

- ***Calluna* height**: 20-30cm
- ***Cladonia* cover**: <4%
- **Macro-topography**: depression
- **Pools**: absent
- ***Sphagnum* cover**: 34-50%
- ***Narthecium* cover**: 4-10%
- **Micro- topography**: Low hummocks/hollows
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (26-33%), *Erica tetralix* (11-25%), *Eriophorum angustifolium* (34-50%), *E. vaginatum* (<4%), *Rhynchospora alba* (<4%), *Andromeda polifolia* (<1%), *Vaccinium oxycoccos* (<1%), *Aulacomnium palustre*(<1%), *Sphagnum capillifolium* (H; 11-25%), *S. papillosum* (H; 11-25%), *S. magellanicum* (H; 4-10%), *S. tenellum* (H; <4%), *S. cuspidatum* (Hollows (Hl); 4-10%).
- **Additional comments: Sc3** is rather wet but *Sphagnum* cover is not particularly high for a sub-central ecotope.

COMPLEX 9/10

- **Location**: this complex dominates **Sc4, Sc5** and **Sc6,** but is also found to the north of **Sc2**
- **Ground**: soft
- **Physical indicators**: absent
- ***Calluna* height**: 31-40cm
- ***Cladonia* cover**: <4%
- **Macro-topography**: gentle slope
- **Pools**: absent
- ***Sphagnum* cover**: 51-75% (34-50% in places)
- ***Narthecium* cover**: <4%
- **Micro- topography**: High hummocks/hollows
- **Tussocks**: *Eriophorum vaginatum* (26-33%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (34-50%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (26-33%), *E. angustifolium* (<4%), *Narthecium ossifragum* (<4%), *Rhynchospora alba* (<4%), *Andromeda polifolia* (<4%), *Sphagnum capillifolium* (H; 34-50%), *S. papillosum* (H & Hl; 4-10%), *S. cuspidatum* (Hl; 4-10%).

- **Additional comments**: This complex is also found in **Sc4** where *Polytrichum alpestre* (<4%) is recorded. **Sc4** grades into a more 9/7/10 vegetation type, with a decrease in the cover of *Eriophorum vaginatum* (11-25%) and *Sphagnum cuspidatum* (Hl; <4%).

  The complex is also found in another 'new' (**Sc6**) area. Here, the cover of *Rhynchospora alba* (11-25%) is higher and that of *Calluna vulgaris* (26-33%) is lower.

COMPLEX 9/7/10

- **Location**: this complex dominates **Sc1** and **Sc2** and is also found within **Sc4, Sc5** and **Sc6**
- **Ground**: soft
- **Physical indicators**: absent
- ***Calluna* height**: 20-30cm
- ***Cladonia* cover**: <4%
- **Macro-topography**: gentle slope to flat
- **Pools**: absent
- ***Sphagnum* cover**: 51-75%
- ***Narthecium* cover**: <4%
- **Micro- topography**: High and low hummocks/ hollows
- **Tussocks**: *Eriophorum vaginatum* (11-25%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (34-50%), *Erica tetralix* (<4%), *Eriophorum vaginatum* (26-33%), *E. angustifolium* (<4%), *Trichophorum germanicum* (<1%), *Andromeda polifolia* (<1%), *Vaccinium oxycoccos* (<1%), *Sphagnum capillifolium* (H; 51-75%), *S. papillosum* (H; 11-25%), *S. magellanicum* (H; 4-10%), *S. tenellum* (H; <4%), *S. austinii* (H; <1%), *S. fuscum* (H; <1%), *S. cuspidatum* (Hl; <4%), *Polytrichum strictum* (<1%).
- **Additional comments:** within **Sc1** *Narthecium ossifragum* becomes more frequent in places particularly in hollows at the edge of sub-central ecotope, where it grades into complex 9/7/6 (sub-marginal).

Quadrat **Qsc1** was recorded within this complex at **Sc2**.

COMPLEX 9/7+P

- **Location**: northern section of **Sc2**
- **Ground**: soft
- **Physical indicators**: bare peat (<4%)
- ***Calluna* height**: 20-30cm

- ***Cladonia* cover**: absent
- **Macro-topography**: depression
- **Pools**: regular (<4%)
- ***Sphagnum* cover**: 51-75%
- ***Narthecium* cover**: 4-10%
- **Micro- topography**: High and low hummocks/lawns/pools/hollows
- **Tussocks**: absent
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (26-33%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (11-25%), *E. angustifolium* (4-10%), *Narthecium ossifragum* (4-10%), *Rhynchospora alba*(4-10%), *Trichophorum germanicum* (<4%), *Sphagnum capillifolium* (H; 26-33%), *S. magellanicum* (H; <4%), *S. papillosum* (H; 11-25%), *S. tenellum* (H; <4%), *S. fuscum* (H; <4%), *S. cuspidatum* (Hl & P; <4%)
- **Additional comments:** only a few pools which are rather small and contain high *Narthecium ossifragum* and *Rhynchospora alba* cover.

Degraded Raised Bog (7120)

Sub-Marginal Ecotope Complexes

COMPLEX 9/7

- **Location**: this complex is found mostly on the middle section of high bog
- **Ground**: soft
- **Physical indicators**: absent
- ***Calluna* height**: 20-30cm
- ***Cladonia* cover**: <4%
- **Macro-topography**: gentle slope
- **Pools**: absent
- ***Sphagnum* cover**: 11-25%
- ***Narthecium* cover**: <4%
- **Micro- topography**: Low hummocks/hollows
- **Tussocks**: *Eriophorum vaginatum* (4-10%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (34-50%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (11-25%), *E. angustifolium* (<4%), *Narthecium ossifragum* (<4%), Rhynchospora alba (<4%), *Sphagnum capillifolium* (H; 11-25%), *S. papillosum* (H; 4-10%), *S. tenellum* (H; <4%), *S. subnitens* (H; <4%)

- **Additional comments:** complex 9/7 becomes 9/7/2 (*Trichophorum germanicum* (4-10%) along the northern section of southern lobe, where vegetation seems to be rewetting as a result of restoration works.

COMPLEX 9/7/6

- **Location**: this is the most widespread sub-marginal ecotope complex on the site and it is found across the entire high bog
- **Ground** soft
- **Physical indicators**: bare peat <4%
- ***Calluna* height**: 20-30cm
- ***Cladonia* cover**: <4%
- **Macro-topography**: gentle slope
- **Pools**: absent
- ***Sphagnum* cover**: 11-25%
- ***Narthecium* cover**: 26-33%
- **Micro- topography**: low hummocks/hollows
- **Tussocks**: *Trichophorum germanicum* (<4%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (26-33%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (4-10%), *E. angustifolium* (<4%), *Narthecium ossifragum* (26-33%), *Trichophorum germanicum* (<4%), *Andromeda polifolia* (<1%), Rhynchospora alba (<4%), *Sphagnum capillifolium* (H; 11-25%), *S. papillosum* (H; 4-10%), *S. tenellum* (H; <4%), *S. subnitens* (H; <4%), *S. cuspidatum* (Hl;<4%).
- **Additional comments:** none

Marginal Ecotope Complexes

COMPLEX 6/7

- **Location**: this complex is found across the entire high bog marginal ecotope
- **Ground**: firm
- **Physical indicators**: bare peat (4-10%)
- ***Calluna* height**: 20-30cm
- ***Cladonia* cover**: <4%
- **Macro-topography**: steep slope
- **Pools**: absent

- ***Sphagnum* cover**: 4-10%
- ***Narthecium* cover**: 34-50%
- **Micro- topography**: low hummocks/*Narthecium ossifragum* flats/ hollows
- **Tussocks**: *Trichophorum germanicum* (<1%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (34-50%), *Erica tetralix* (<4%), *Eriophorum vaginatum* (<4%), *E. angustifolium* (<4%), *Narthecium ossifragum* (34-50%), *Trichophorum germanicum* (<1%), *Sphagnum capillifolium* (H; <4%), *S. tenellum* (H; <4%), *S. subnitens* (H; <4%), *S. papillosum* (H; <4%).
- **Additional comments**: this complex has particularly tall *Calluna vulgaris* plants (up to 40cm) to the northeast of high bog (GR 283220/268546).

COMPLEX 7/2

- **Location**: this complex is found across the entire high bog marginal ecotope
- **Ground**: firm
- **Physical indicators**: bare peat (<4%)
- ***Calluna* height**: 20-30cm
- ***Cladonia* cover**: <4%
- **Macro-topography**: steep slope
- **Pools**: absent
- ***Sphagnum* cover**: 4-10%
- ***Narthecium* cover**: 26-33%
- **Micro- topography**: low hummocks/*Narthecium ossifragum* flats/ *Trichophorum germanicum* tussocks
- **Tussocks**: *Trichophorum germanicum* (4-10%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (26-33%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (4-10%), *E. angustifolium* (<4%), *Narthecium ossifragum* (26-33%), *Trichophorum germanicum* (4-10%), Rhynchospora alba (<4%), *Sphagnum capillifolium* (H; <4%), *S. tenellum* (H; <4%), *S. papillosum* (H; <4%).
- **Additional comments**: none

Face bank Complexes

COMPLEX 1

- **Location**: this complex was found along the bog margin
- **Ground**: firm
- **Physical indicators**: bare peat (4-10%)
- ***Calluna* height**: <50cm
- ***Cladonia* cover**: <4%
- **Macro-topography**: steep slope
- **Pools**: absent
- ***Sphagnum* cover**: generally absent but <4% in places
- ***Narthecium* cover**: <4%
- **Micro- topography:** tall robust *Calluna vulgaris*/low hummocks
- **Tussocks:** *Trichophorum germanicum* (<4%)
- **Degradation or regeneration evidence**: absent
- **Species cover**: *Calluna vulgaris* (76-90%), *Erica tetralix* (4-10%), *Trichophorum germanicum* (<1%), *Narthecium ossifragum* (<4%), *Andromeda polifolia* (<1%), *Sphagnum capillifolium* (H; <1%), *S. tenellum* (H; <1%), *S. subnitens* (H; <1%), *Hypnum jutlandicum* (<4%).
- **Additional comments**: none

Depressions on peat substrates of the Rhynchosporion (7150)

The habitat occurs at Killyconny Bog in both Active and Degraded Raised Bog, but it is only occasional found on degraded habitat. Only *Rhynchospora alba* was recorded within the 2011 survey at this site.

R. alba is found in all ecotopes except the face bank in Killyconny Bog, such as: central ecotope (complex 15); sub-central ecotope (9/10; 9a/10; 9/7+P); sub-marginal ecotope (9/7; 9/7/6) and marginal ecotope (7/2).

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

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

Appendix II Photographical records

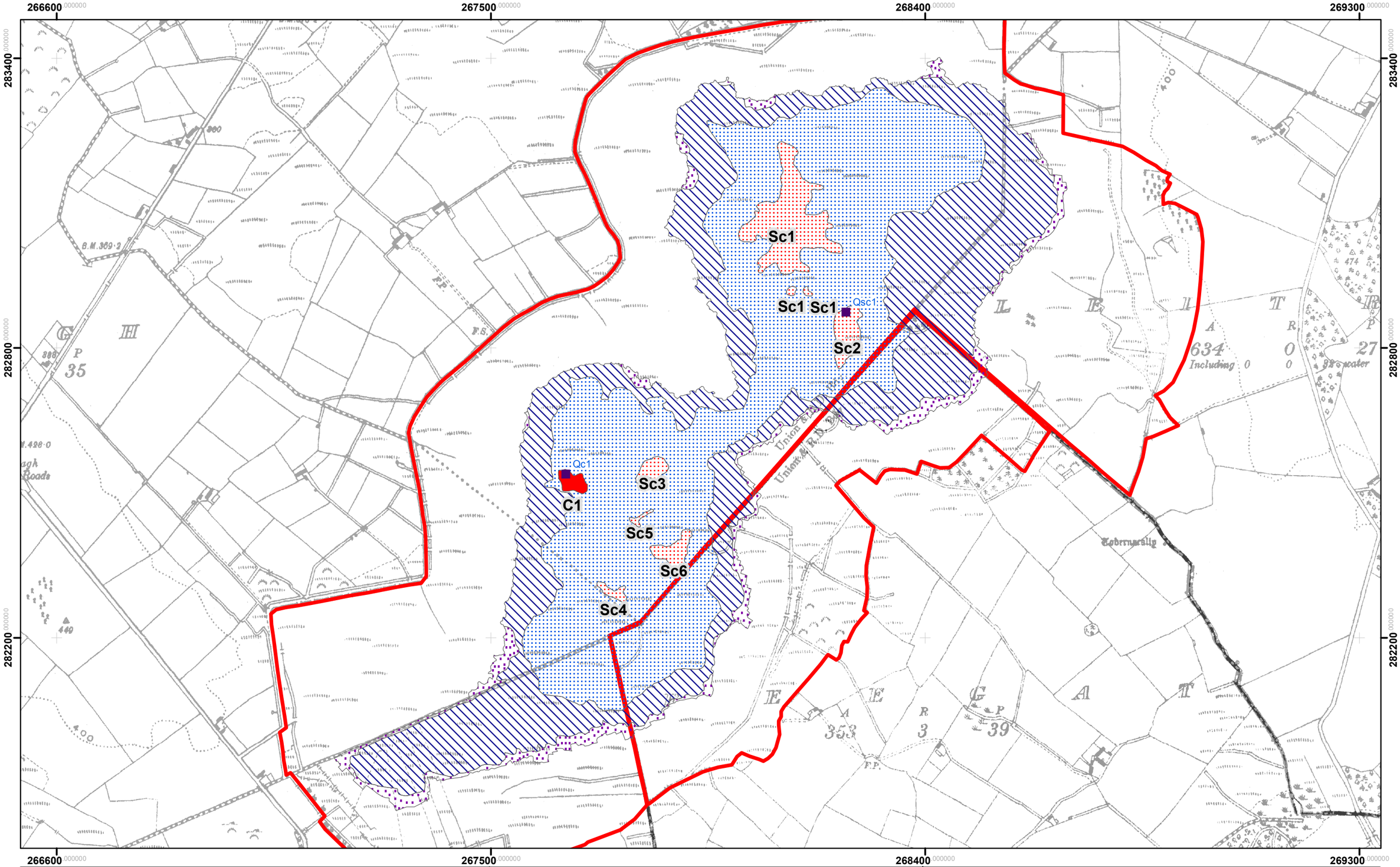
Photograph Number	Aspect	Type	Feature	Date
102-0512	W	Overview	Qc1	12/10/2011
102-0511	NW	Overview	Qsc1	12/10/2011

Appendix III Quadrats

Ecotope type	Central	Central	Sub-central	Sub-central
Complex Name	**14**	**15**	**9/10**	**9/7/10**
Quadrat Name	Qc1	Qc1	Qsc1	Qsc1
Easting	267651	267655	268230	268235
Northing	282540	282538	282874	282874
Firmness	Quaking	Quaking	Firm-soft	Soft
Burnt	No	No	No	No
Algae in hollows %	4-10	Absent	1-3 (many indiv)	Absent
Algae in pools %	4-10	Absent	Absent	Absent
Bare peat %	Absent	1-3 (many indiv)	Absent	Absent
High hummocks %	na	11-25	na	34-50
Low hummocks %	34-50	26-33	34-50	11-25
Hollows %	4-10	4-10	34-50	11-25
Lawns %	Absent	Absent	Absent	Absent
Pools %	34-50	26-33	Absent	Absent
Pool type	Interconnecting	Interconnecting	Absent	Absent
S.austinii hum type	na	Absent	na	Active
S.austinii hum %	4-10	Absent	4-10	1-3 (many indiv)
S.austinii height(cm)	na	Absent	na	21-30
S.fuscum hum type	Absent	Absent	Absent	Absent
S.fuscum hum %	Absent	Absent	Absent	Absent
S.fuscum height(cm)	Absent	Absent	Absent	Absent
Leucobryum glaucum	Absent	Absent	Absent	Absent
Trichophorum type	Absent	Absent	Tussocks	Tussocks
Trichophorum %	Absent	Absent	4-10	1-3 (many indiv)
S.magellanicum %	4-10	1-3 (many indiv)	Absent	Absent
S.cuspidatum %	26-33	26-33	Absent	Absent
S.papillosum %	4-10	4-10	4-10	11-25
S.denticulatum %	4-10	Absent	Absent	Absent
S.capillifolium%	34-50	26-33	34-50	34-50

S.tenellum %	na	1-3 (many indiv)	na	4-10
S.subnitens %	Absent	Absent	Absent	Absent
R.fusca %	Absent	Absent	Absent	Absent
R.alba %	4-10	4-10	Absent	Absent
N.ossifragum %	4-10	4-10	4-10	1-3 (many indiv)
Sphag pools %	26-33	26-33	4-10	Absent
Dominant pool Sphag	S. cuspidatum	S. cuspidatum		
Sphag lawns %	Absent	Absent	Absent	Absent
Sphag humm %	34-50	34-50	34-50	51-75
Sphag holl %	34-50	34-50	Absent	4-10
Total Sphag %	51-75	51-75	51-75	51-75
Hummocks indicators	S. austinii	Absent	S. austinii	S. austinii
Cladonia portent %	4-10	Absent	4-10	Absent
Other Cladonia sp	Absent	Absent	Absent	Absent
C. panicea %	Absent	Absent	Absent	Absent
Calluna cover %	26-33	26-33	11-25	26-33
Calluna height(cm)	21-30	11-20	21-30	31-40
Other NotableSpecies		P. strictum, A. palustre, V. oxycoccos		
Other comment	wetter	previously classed 14,but is borderline Sc	stable	reclassified as 9/7/10
Date	**02/09/2004**	**12/10/2011**	**02/09/2004**	**12/10/2011**

Appendix IV Survey maps



Raised Bog Monitoring Survey 2011

Map 1: Ecotopes Map and Quadrats

Ecologic Environmental & Ecological Consultants Ltd.

Killyconny Bog SAC (000006)
Co. Meath/Co. Cavan

1:7,500

N

0 95 190 380 570 760 Meters

Legend

- Quadrat
- Ecotope type
  - Central
  - Sub-central
  - Bog Woodland
  - Woodland
  - Active Flush
  - Open water
  - Sub-marginal
  - Inactive Flush
  - Marginal
  - Face bank
  - SAC

266600 000000 | 267500 000000 | 268400 000000 | 269300 000000

283400 000000 | 282800 000000 | 282200 000000

Raised Bog Monitoring Survey 2011

Map 2: Vegetation community complexes

Ecologic Environmental & Ecological Consultants Ltd.

Killyconny Bog SAC (000006)
Co. Meath/Co. Cavan

N

1:7,500

0 105 210 420 630 840 Meters

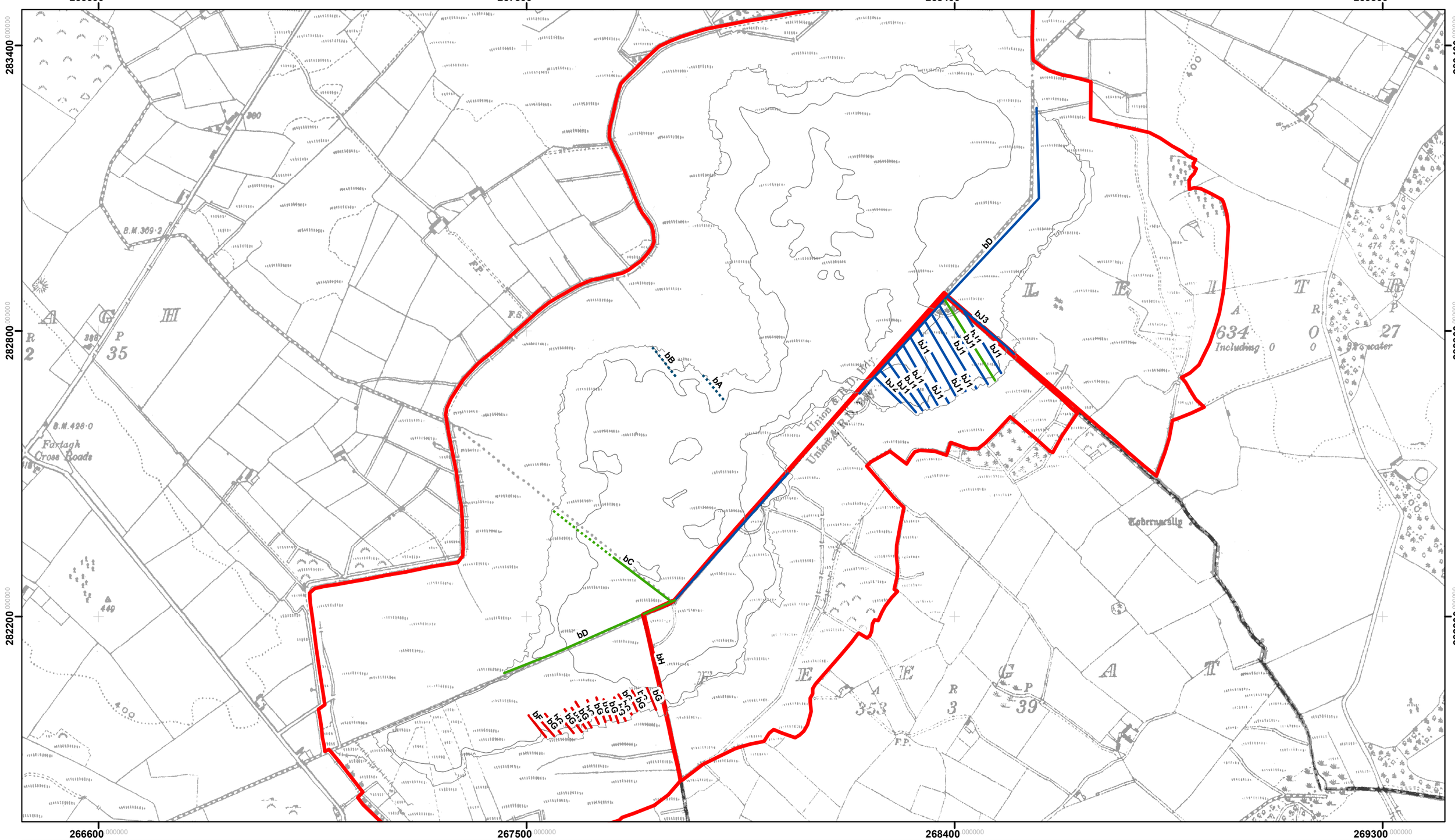
Legend

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 Survey 2011

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

Ecologic Environmental & Ecological Consultants Ltd.

Killyconny Bog SAC (000006)
Co. Meath/Co. Cavan

N

1:7,500

0 100 200 400 600 800 Meters

Legend

High Bog drainage

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