

# All Saints Bog (SAC 000566), Co. Offaly

## 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 All Saints 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, Bog Woodland, Degraded Raised Bog and Depressions on peat substrates of the Rhynchosporion.

Active Raised Bog covers 39.78ha (17.84%) of the high bog area. Central ecotope is absent from the site, and high quality Active Raised Bog consists solely of active flush featuring *Sphagnum* lawns, hummocks and hollows. *Sphagnum* cover reaches 90% in certain locations.

Degraded Raised Bog covers 183.17ha (82.16%) 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. The habitat also includes some inactive flushes many of them wooded.

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.

All Saints Bog features a large birch and pine dominated Bog Woodland covering 14.34ha with an abundant bryophyte layer and a particularly diverse *Sphagnum* species cover.

The current conservation objective for All Saints Bog is to restore the area of Active Raised Bog and Bog Woodland 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 Bog Woodland is 17.48ha while that for Active Raised Bog is 142.87ha (which includes the area of Bog Woodland). 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 a slight increase in the area of Active Raised Bog (1.71ha) at All Saints Bog in the 2005 to 2011 period. This has mostly taken place along the southern section and within active flush vegetation. However, the distribution of the habitat has changed considerably and habitat losses have taken place particularly along the northern section. The expansion across the southern high bog is partially due to vegetation recovery after the 2002/3 severe fire event, but, may also be due to subsidence which may be associated with falling water table levels in the underlying mineral subsoil layers associated with the quarrying activity taking place adjacent to the high bog. Falling water tables are likely to be causing changes in the hydrological functioning of the high bog (more water running towards the south) with unpredictable negative consequences Active Raised Bog and Bog Woodland. Some new peat forming areas have been described at the site, which are the result of a more comprehensive field mapping rather than actual changes.

The 2011 survey has also noted further drying out processes in the northwest of the high bog as well as the spread of pine, illustrated by the abundance of pine plants on many sections across the entire high bog, but particularly within inactive flushes and the drier sections of active flushes and Bog Woodland.

Peat cutting, drainage and quarrying to the south of the high bog are the most threatening current activities at the site. 0.42ha of high bog have been lost in the reporting period due to peat cutting and this activity is considered to be one of the reasons for the decline in Active Raised Bog along the northern section of high bog. 27km of drains remain functional mostly associated with the moss peat exploitation to the north east of the high bog. Quarrying is likely to have induced changes in the high bog hydrology with negative consequences on Active Raised Bog. 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 has slightly increased and quality improved in the reporting period. However, current area value is below favourable reference values, whereas S&Fs above reference value. Future Prospects are considered Unfavourable Bad-Declining as impacting activities (peat cutting, drainage and quarrying) continue to threaten the habitat.

**Bog Woodland** has been given an **Unfavourable Bad-Declining** assessment.

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

A series of **recommendations** have been also given, these include: cessation of peat cutting; assessment of the actual impact of quarrying activity adjacent to the high bog; restoration works on the high bog and cutover areas, including the moss peat exploitation area; further hydrological and topographical studies to ascertain more accurate FRVs; further botanical monitoring surveys, particularly in relation to Bog Woodland.

## Site identification

<b>SAC Site Code</b>	000566	<b>6" Sheet:</b>	OY 29
<b>Grid Reference:</b>	E 201145 / N 211195	<b>1:50,000 Sheet:</b>	53
<b>High Bog area (ha)<sup>1</sup>:</b>	222.95ha		
<b>Dates of Visit:</b>	04 to 06/10/11		
<b>Townlands:</b>	Glaster, Ballynasrah, Kilnaglinny, Coolaghansglaster and Macnamanny or Fulough.		

## Site location

All Saints Bog is located 8km north-northwest of Birr and 6km south of Banagher. The Rapemills River borders the northern edge. A gravel ridge runs to the south, south of which the Little Brosna River flows.

The site may be accessed from a small road that runs beside the gravel pit at its southern side. This small road is to the west off the Cloghan to Borrisokane road (R438), just north of the Little Brosna River. A grassy track from beside an old house leads onto the southern side of the bog.

Kelly *et al.* (1995) grouped All Saints Bog with the raised bogs of south Offaly/ north Tipperary. It lies 7km to the east of Redwood Bog (SAC 002353). It also lies approximately 5-6km to the north of Ballyduff and Clonfinane (SAC 000641).

## Description of the survey

The survey was carried out in October 2011 and involved a vegetation survey of the high bog at All Saints 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

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<sup>1</sup> This figure is slightly smaller than the one given in 2005, as a result of improvement on mapping accuracy; based on 2010 aerial photography.

present. These included: species lists; estimation of % cover of dominant species; percentage *Sphagnum* cover; evidence of damage (due to burning, peat cutting or drainage); micro-topography; ground firmness; and presence of *Cladonia* species. A list of photographic records is given in Appendix II. The survey aimed to assess the conservation status of Habitats Directive (Council Directive 92/43/EEC) Annex I habitats on the high bog.

The entire high bog of All Saints Bog was re-surveyed. Sections mapped as sub-marginal, sub-central and central ecotope in 2005 were surveyed in more detail. These are the areas where changes were likely to have occurred. Quadrats, which describe the micro-topographical features and indicator species, recorded in the 2005 project (Fernandez *et al.* 2005) were re-surveyed and additional quadrats were recorded where necessary, particularly Bog Woodland quadrats (see Appendix III). The size of quadrats was 4m x 4m for Active Raised Bog and 10 x 10m for Bog Woodland.

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

All Saints Bog has a roughly triangular and relatively simple shape. The site has been cut away most intensively along the northern edge. The whole bog is generally rather flat in the central part with slopes towards the edges which are particularly steep to the north near the peat cutting activity. In some places the slopes may be becoming steeper due to subsidence caused by drainage and/or peat cutting.

This medium size bog is a Midland Raised Bog (Cross, 1990) and an example of Ridge River Bog (Kelly *et al.* 1995) as it lies has developed between and esker ridge to the south and the Rapemills River to the north. Cross (op cit) describes the site as the only known example of a raised bog in Ireland with extensive wet *Betula* woodland.

According to Kelly *et al.* (1995) a mineral ridge runs east-west under the site coincident with the main flush. The peat layer is shallower in this area.

## Ecological Information

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

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

- Active Raised Bog (EU code 7110),
- Degraded Raised Bog (EU code 7120),
- Bog Woodland (EU code 91D0) and
- Depressions on peat substrates of the Rhynchosporion (EU code 7150).

#### *Active Raised Bog (7110)*

The current area of Active Raised Bog at All Saints Bog is 39.78 ha (17.84% of the high bog), which is a decrease of 26.8ha since 1994.

Active Raised Bog includes sub-central ecotope, active flushes and Bog Woodland.

Sub-central ecotope was found at eight locations (**Sc1** to **Sc8**) (see Appendix IV, Map 1). Only two community complex types were recorded. Complex 9/10 consists of tall and low hummocks and hollows. Pools are absent and *Sphagnum* cover ranges from 51 to 75%. *Calluna vulgaris*, *Erica tetralix* and *Eriophorum angustifolium* dominate; *Sphagnum magellanicum* and *S. papillosum* dominate the hummocks layer which also features *S. capillifolium*, *S. subnitens*, *S. tenellum*, *S. austinii* and *S. fuscum*. Hollows consist of *S. cuspidatum*. Some sections of this complex feature flush type species (e.g. *Aulacomnium palustre*, *Polytrichum commune* var. *commune*, *Vaccinium oxycoccos*). The second sub-central ecotope community complex is complex 4/10. This complex is characterised by the abundance of *Rhynchospora alba*. The micro-topography also consists of hummocks and hollows, and pools are absent. This complex is characterised by a thin *Sphagnum* layer with abundant *S. papillosum* and other *Sphagnum* species (*S. capillifolium*, *S. magellanicum*, *S. subnitens*, *S. austinii* and *S. fuscum* forming hummocks and *S. cuspidatum* in hollows). Other species recorded include *Menyanthes trifoliata* and *Aulacomnium palustre*.

Four active peat forming flushed areas are also present at All Saints Bog (**F3**, **F4**, **F5** and **F8**). All but **F8** are wooded flushes dominated by *Betula pubescens* or *Pinus sylvestris* trees with a dense bryophyte cover characterised by abundant *Sphagnum* species. However, their canopy cover is now

too open (<30%) to be considered Bog Woodland. F5 lies in a small depression that is likely to have developed as a result of subsidence associated with peat cutting. F8 was previously (Kelly *et al.*, 1995) mapped as Bog Woodland, but a severe fire event in 200/3 seriously damaged the woodland canopy and it is now considered to be an active peat forming wooded flush. The edge of F8 is not wooded.

Bog Woodland although considered to be part of the Active Raised Bog is described separately below.

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#### Degraded Raised Bog (7120)

The current area of Degraded Raised Bog at All Saints Bog is 183.17ha (82.16% of the high bog).

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

The sub-marginal ecotope features the most developed micro-topography within Degraded Raised Bog. Although pools are mostly absent from the high bog, they are found within the wettest sub-marginal ecotope community complex (9/7/6+P). However, these pools generally feature a low *Sphagnum* cover and are mostly covered with algae. This complex is found in an area previously classified as sub-central ecotope. The micro-topography generally consists of hummocks, hollows and *Nartheicum ossifragum* flats in places. Overall the *Sphagnum* cover within sub-marginal ecotope ranges from 11 to 25%. *Calluna vulgaris*, *Erica tetralix*, *Eriophorum vaginatum*, *Nartheicum ossifragum* and *Carex panicea* are the most common species within this ecotope. The *Sphagnum* hummocks consist of *S. capillifolium*, *S. papillosum* and *S. magellanicum*. *S. austinii* and *S. fuscum* are also found. The hollows contain *Eriophorum vaginatum*, *E. angustifolium*, open water and occasionally *Sphagnum cuspidatum*. *Nartheicum ossifragum* colonises the hollows in drier sections of the habitat. The alien and disturbance indicator species *Campylopus introflexus* was found in places.

Marginal ecotope is slightly drier than sub-marginal ecotope and mainly occurs as a narrow band near the margins of the high bog. The micro-topography consists of *Calluna vulgaris* hummocks, low *Sphagnum* hummocks, flats and very occasionally hollows and tear pools. The *Sphagnum* cover is even lower here than in the sub-marginal ecotope (<10%) and the vegetation is characterised by a higher cover of *Carex panicea*, *Nartheicum 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 covers a large area near the moss peat exploitation to the north-east of the high bog where several functional drains continue to discharge water from high bog.

The high bog also features several inactive flushes (**F1&F2, F4, F6 and F7**). The first four flushes are wooded and some of them are classified as Dry Woodland dominated by *Pinus sylvestris* trees. *Pteridium aquilinum* becomes abundant in some sections and the overall *Sphagnum* cover is low (<25%). F6 appears to have expanded due to further drying out processes. F7 is located on an elevated ridge and is not wooded although some *Betula pubescens* are present.

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#### *Depressions on peat substrates of the Rhynchosporion (7150)*

Rhynchosporion vegetation is widespread on All Saints Bog. It is found in both Active and Degraded Raised Bog, but tends to be best developed and most stable in the wettest areas of Active Raised Bog. In these areas, the Rhynchosporion vegetation occurs within *Sphagnum* hollows and along *Sphagnum* pool edges and on lawns. However, neither pools nor lawns are very common at this site. Typical plant species include *Rhynchospora alba*, *Sphagnum cuspidatum*, *S. magellanicum*, *S. papillosum*, *Drosera anglica* and *Eriophorum angustifolium*.

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

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#### *Bog Woodland*

Bog Woodland is found at four different locations on the high bog at All Saints Bog (**Bw1 to Bw4**) and it covers 14.34ha.

This is considered the most extensive example of wet birch wood on a raised bog in Ireland (Cross, 1987).

Either *Betula pubescens* or *Pinus sylvestris* dominate the different sections of the woodland

The trees are mostly 8-10m but some reach 12 to 15m. *Betula*, *Pinus* and *Salix* dominate the shrub layer. The understorey contains *Molinia caerulea*, *Calluna vulgaris*, *Empetrum nigrum*, *Vaccinium myrtillus*, *Dryopteris carthusiana*, *Pteridium aquilinum*, *Eriophorum vaginatum*, *Rubus fruticosus*, *Anthoxanthum odoratum*, *Holcus lanatus*, *Hedera helix*, *Osmunda regalis* and *Myrica gale*. The abundance of bryophyte species is a common factor within the Bog Woodland. *Sphagnum* species are frequently found forming hummocks and hollows, the most common species being *S. capillifolium*, *S. fimbriatum*, *S. fallax*, *S. palustre* and *S. cuspidatum*. Other mosses recorded are



*Aulacomnium palustre*, *Hylocomium splendens*, *Pseudoscleropodium purum*, *Polytrichum commune* var. *commune*, *Dicranum scoparium* and *Rhytidiadelphus* spp.

### Detailed vegetation description of the high bog

A detailed description of high bog vegetation recorded during the 2011 survey of All Saints 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 All Saints 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	H	-1	Two locations: to southwest (10ha) and south (6ha)	Southwest (50m from high bog) and south (220m from high bog)	7110/7120/7150/91D0
C01.03	Peat extraction	H	-1	0.42ha cut away	11 different locations long north high bog section	7110/7120/7150/91D0
J02.07	Drainage	H	-1	27.393km <sup>1</sup>	On HB	7110/7120/7150/91D0
J02.07	Drainage	H	-1	n/av	Adjacent to	7110/7120/7150/91D0

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

<sup>1</sup> This figure only includes functional and reduced-functional drains.

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

## Peat cutting

This activity has taken place at 11 locations along the northern section of high bog in the 2005-2011 period and has reduced the area of high bog by 0.42ha. According to NPWS regional staff peat cutting took place at three locations in 2011 (Bugler, N., pers. comm., 2011). More recent information from the NPWS indicates that no cutting took place in 2012-13. However, the complete cessation of this activity at the site and that it will not be reinitiated cannot be confirmed.

Peat cutting has been particularly intensive at some of these locations. For instance the plot (former plots 15 & 16 reported by Fernandez *et al.* (2005)) to the northwest of **F4** and **F5** (GR 200843/211810) consists of a 100m face bank that is 2.5m high, with associated high bog slumping and major subsidence (2m in a 50-75m distance). The plot immediately north of **F4** and **F5** (former plot 13 reported by Fernandez *et al.* (2005)) is currently located 50m from Active Raised Bog and features 2.5m face banks, and deep cracks at the edge of the high bog, as well as considerable subsidence (3-4m in a 50-75m distance). Typical face bank vegetation has stretched further into the high bog than is usual at this plot.

Cutting and associated drainage along the northern high bog section have caused modifications on the northern high bog hydrology and are considered to have directly caused the decline in Active Raised Bog (former Sc1 and Sc10).

The moss peat exploitation on the northeast section of the high bog is no longer active, but still remains bare of vegetation and with multiple drains functional that continue to impact on the high bog habitats. Water running off the high bog was noted within drains on the northern section of this area of former moss peat exploitation.

This activity is considered to have a high importance/impact on high bog habitats. The continuation of these peat cutting will prevent the recovery of the high bog, and the recovery of ARB towards FRVs as restoration works cannot be employed until such activities stop. In addition, old face banks and high bog and cutover drainage associated with cutting continue to cause negative impacts on the high bog habitats.

## Drainage

### High bog drainage

Table 6.2 shows no change on the status of high bog drains. The majority of drains in the high bog remain functional (27.361km), mostly within moss peat exploitation area. Significant water losses through the drains were noted within the north-western section of bF complex.

High bog drains, including those within the moss peat exploitation, are considered to have high importance/impact on high bog habitats.

No blockage of drains has occurred to date.

Table 6.2 High bog drainage summary

Status	2005 (km) <sup>1</sup>	2011 (km)	Change
<b>NB: functional</b>	27.361	27.361	0.000
<b>NB: reduced functional</b>	0.032	0.032	0.000
<b>NB: non- functional</b>	1.219	1.219	0.000
<b>B: functional</b>	n/a	n/a	n/a
<b>B: reduced functional</b>	n/a	n/a	n/a
<b>B: non- functional</b>	n/a	n/a	n/a

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

<sup>1</sup> 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 All Saints Bog including any change in their functionality in the 2005 – 2011 reporting period (see Map 3).

Table 6.3 High bog drainage detail

Drain Name	Length (km)	2005 status	2011 status	Change	Comment
bA	0.152	NB: non-functional	NB: non- functional	No	
bB	0.256	NB: non-functional	NB: non- functional	No	

bC	0.290	NB: functional	NB: functional	No	
bD	0.301	NB: functional	NB: functional	No	
bE	0.444	NB: functional	NB: functional	No	
bF	4.815	NB: functional	NB: functional	No	Running water noted within north-western section of complex.
bH	0.811	NB: non-functional	NB: non-functional	No	
bJ	21.511	NB: functional	NB: functional	No	Bare peat area drain complex
bK	0.032	NB: reduced functional	NB: reduced functional	No	Drain not recorded in 2005, but already present; Infilling taking place

### Bog margin drainage

The cutover areas were not surveyed for drains during 2011.

Drains associated with either currently active or no longer active peat cutting are present along the entire cutover, except on the southeast and southwest sections. These drains continue to drain the high bog and impact on high bog habitats.

Drainage maintenance is evident on the 2010 aerial photograph along the northeast margin of high bog, associated with agriculture improvements.

A new T shaped drain has been recently deepened in an area between agriculture reclaimed land and cutover on the southeast of the site (GR 201489/210263) (Photo 102-0483). This is part of an agriculture improvement operation that also included scrub removal. The drain is 2-3m wide and 1-1.5m deep and is currently full of water (0.5m in places). Water was recorded running from the cutover into this deepened drain.

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

### Fire history

Fernandez *et al.* (2005) mentioned the frequent occurrence of burning at the site. A severe fire event damaged the southern section of high bog including part of the Bog Woodland in 2002/3.

NPWS regional staff mentioned the occurrence of fires in 2010 and 2011 on old Erin peats cutover and private lands to the east, but not on the high bog (Bugler pers. comm., 2011).

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

### Other impacting activities

Two quarrying operations have operated adjacent to the site; the first one is located 50m to the southwest of the high bog and has a total area of 10ha; the second one is located 220m to the south of high bog and covers a 6ha area. Neither of the two operations were visited during 2011. Fernandez *et al.* (2005) mentioned that the second operation (Coneycarn pit) is located in an esker deposit. The first operation (Banagher Concrete) still has water in ponds from quarrying below the water table (Bugler pers. comm., 2011).

No impact assessments have been carried out to evaluate the impact of these activities on the high bog habitats. However, the 2011 survey and maps (map 3) shows considerable changes along the southern section of the high bog: there are obvious water flow patterns towards the southern cutover, an expansion of Active Raised Bog towards the south of the high bog and a decrease and drying out of Active Raised Bog along the north including in the former Bog Woodland section (now inactive flush F6). These changes indicate that the quarrying activity is likely to have altered the hydrology of the high bog and is thus impacting on it habitats (see section 8.1 for further detail). As a result quarrying activity adjacent to the high bog is considered to have a high importance/impact on high bog habitats.

No other significant impacting activities were noted or recorded in 2011 impacting high bog habitats in the 2005-2011 reporting period.

### Conservation activities

Although no physical management actions such as the blocking of drains or the restoration of the former moss 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. There are ongoing negotiations to try to phase out cutting in some parts of the bog that are still in private ownership (Bugler, N., pers. comm., 2011). Despite negotiations, peat cutting continued in 2011.

## Conservation status assessment

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

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

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

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

### Active Raised Bog (7110)

#### *Area*

Although table 8.1 indicates an increase (1.71ha) in the area of Active Raised Bog, the distribution of the habitat has changed considerably and losses of Active Raised Bog have taken place. The former Sc1 (2.20ha) and Sc10 (0.10ha) are no longer present. Both have disappeared as a result of peat cutting on adjacent turf plots. These plots were within 45m of Sc1 and Sc10 in 2005 and 12m of high bog was cutaway here between 2005 and 2011. Subsidence associated with this activity has also caused the development of an active flush depression (F5, 0.016ha) close to the high bog edge. Both Kelly *et al.* (1995) and Fernandez *et al.* (2005) already mentioned losses of Active Raised Bog within the northeast of the high bog due to peat cutting.

Sc2 has decreased in area (0.26ha in the 2005-2011 period). This section of high bog seems to be drying out as there has also been an expansion (approx. 1 ha) of the inactive flush (F6) in this area at the expense of active flush/Bog woodland (see Map 1).

**Sc3** has also seen slight changes in its boundary, mostly as result of a more comprehensive survey and increased mapping accuracy in the 2011 survey. However, some actual changes may have also taken place. Fernandez *et al.* (2005) suggested some migration of sub-central vegetation towards the north, associated with subsidence due to peat cutting. An obvious flow pattern towards the northwest high bog edge was also noted in 2011. This flow pattern highlights the potential high negative impact that any activity such as peat cutting or drainage taking place on the northwest cutover could have on **Sc3**.

Changes in the boundary of **Sc7** have taken place as a result of a more comprehensive survey in 2011.

**Sc4** is much smaller than the area that was mapped in 2005. However, this is simply because the northern section has been re-allocated to active flush (**F4**) due to the presence of flush type species.

Former **Sc5** only contained two sub-central dot records that the 2011 survey confirmed to be located on a drain. Therefore, former **Sc5** is considered to correspond mostly with sub-marginal ecotope. A new **Sc5** section has been recorded immediately to the southwest of the former **Sc5**.

Former **Sc9**, which was depicted as two separate sub-central sections in 2005, now only consists of three sub-central dot records. These sub-central patches are now considered too small to be mapped as a sub-central ecotope polygon.

Another two new sub-central areas (**Sc1** and **Sc8**) have been reported in 2011. These areas are likely to have been missed in the 2005 survey. Therefore, they are not considered to correspond with newly developed Active Raised Bog. In addition to these areas, other smaller pockets of sub-central ecotope have also been recorded during the 2011 survey (e.g. between **Sc6** and **Sc8**). These new active peat forming areas are too small to be mapped and only sub-central ecotope dots have been mapped.

**Sc6** is much larger than mapped in 2005 (2.27ha). Although part of this increase of sub-central ecotope may be due to vegetation recovery since the 2002/3 burn, the 2011 survey noted an obvious water flow pattern towards the southeast bog edge within **Sc6**. The southern section of **Sc6** is characterised by a thin acrotelm layer (i.e. living *Sphagnum* layer) and abundant *Rhynchospora alba*. This type of vegetation is generally associated with fast water flows near the high bog edge associated with subsidence. Therefore, part of the expansion of sub-central is likely to be the result of subsidence caused by falling water table levels in the underlying mineral subsoil layers associated with quarrying activity adjacent to high bog (further hydrological studies would be needed to confirm this theory). The expansion of sub-central in these areas although apparently positive indicates that there have been changes in the hydrological flow patterns within the high

bog. This may have unpredictable negative consequences on Active Raised Bog and Bog Woodland within the site.

Similar processes to those described for Sc6 are likely to have taken place along the southern section of F4 with changes associated with burn recovery (e.g. the area to the north of Sc6 previously deemed inactive) but also changes in flow patterns (i.e. more water flowing towards southeast) (e.g. area surrounding F8 previously deemed inactive and expanding towards southeast). Overall, F4 area has increased by 3ha within the 2005 to 2011 period.

To summarise it is estimated that there has been an overall loss of 0.29ha of sub-central ecotope (see table 8.1) with a loss of 2.56ha within **Sc1**, **Sc2** and **Sc10**, but an increase of 2.27ha within **Sc6**. On the other hand, active flush area has increased overall by approx. 2ha, based on a 3.02ha increase (3ha within southern section of F4 and 0.02ha at F5) and an approximately 1ha loss (F6 and surrounding area) in the reporting period. The new ecotope map shows an increase of Active Raised Bog vegetation along the southern half of the high bog (F4 and Sc6 particularly), although a big portion of this increase is due to the recovery of vegetation from the 2002/3 fire event. Some of the increase seems to be due to changes in surface water flow patterns: there appears to be more water flowing towards the southern cutover – this is likely to be as a result of subsidence caused by falling water table levels in the underlying mineral subsoil layers –the falling water table levels is itself likely to be caused by the quarrying activity adjacent to the high bog (further hydrological studies would be needed to confirm this theory).

Although the loss of sub-central ecotope along the northern section is related to drying out processes and subsidence caused by peat cutting along the northern high bog edge, some of the decline in Active Raised Bog may also be connected to changes in hydrological flow patterns in the southern sections mentioned previously

The favourable reference value (FRV) for Area is considered to be the sum of Active Raised Bog (central, sub-central ecotopes, active flush and Bog Woodland) plus sub-marginal ecotope when the Habitats Directive came into force in 1994 (see table 8.4). Therefore, Active Raised Bog Area FRV is 142.87ha (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 (39.78ha) is 72.16% below the FRV. A current Area value more than 15% below FRV falls into the **Unfavourable Bad** assessment category.

Although a long term (1994/5-2011) trend indicates a reduction in the area of Active Raised Bog at the site (26.38ha) (see table 8.1). A more recent and short term trend analysis (6 years; 2005-2011)



gives a more optimistic result with a 1.71ha (4.49%) increase of Active Raised Bog. Therefore, the habitat Area is given an **Increasing** trend assessment.

**The Area of Active Raised Bog at All Saints Bog is assessed as Unfavourable Bad-Increasing** (see table 8.5).

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### 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 12.72ha (half of 25.44ha, the current area of Active Raised Bog (excluding Bog Woodland)). The current value is 18.9ha which is 48.58% above the FRV. Therefore S&Fs are given a **Favourable** assessment.

Both a long term (1994/5-2011) and short term (6 years; 2005-2011) indicate an increase of the area of active flush and therefore the S&Fs are given an **Improving** trend. However, it should be highlighted that although the overall sub-central ecotope area only slightly decreased in the short term period considerable losses took place along the northern high bog section also within this period.

Quadrats analysis (**Qsc2**, **Qsc3**, **Qsc4** and **Qsm1**) indicates the following:

**Qsm1:** this quadrat was previously classified as sub-central ecotope (Qsc1; complex 9/10). Some changes have been noted: there has been a reduction in algae cover, bare peat cover and *Trichophorum* cover; a slight increase in *Sphagnum* hollows cover; *Sphagnum* pools reported as having 4-10% cover in 2005 are now absent (the 2005 pools may have been considered hollows in 2011 and thus no actual change may have occurred); *S. papillosum*, *S. subnitens* are now present. The quadrat is located in the best vegetation type in the surrounding area which is considered to be typical sub-marginal vegetation. The 2005 description stated that the quadrat was located in an area of borderline sub-marginal/sub-central vegetation.

**Qsc2:** slight variation of quadrat data: slight increase in *Sphagnum* hollows cover; *Sphagnum* pools reported as having 1-3% cover in 2005 are now absent (the 2005 pools may have been considered hollows in 2011 and thus no actual change may have occurred); *S. austinii*, *S. magellanicum*, *S. subnitens* and *Leucobryum glaucum* are now present; *S. cuspidatum* 4-10% cover in 2005 is now absent; slight decrease in *S. capillifolium* and *S. papillosum*; slight increase in *Calluna vulgaris* cover. The changes within this quadrat are very slight and are likely to be the result of observer variation as well as lack of precision in relocating of the quadrat.

**Qsc3:** slight variation of quadrat data: reduction in algae cover and bare peat cover; *Sphagnum* lawns and pools reported as having 4-10% and 1-3% cover respectively in 2005 are now absent; *S. austinii*, *S. subnitens*, *Leucobryum glaucum*, *Trichophorum germanicum* now present; *Sphagnum fuscum* now absent; slight reduction in *S. cuspidatum*, *S. capillifolium*, *Rhynchospora alba* and *Narthecium ossifragum* cover; slight increase in *Sphagnum* hummocks cover; slight decrease in *Sphagnum* hollows cover. These changes are likely to be the result of a potential discrepancy in quadrat location, but also natural succession where pools, lawns are replaced by hummocks, as no evidence of degradation were noted within Sc3 where Qsc3 is located.

**Qsc4:** slight variation of quadrat data: reduction in algae cover; increase in *Sphagnum* hummocks and hollows cover; slight decrease in *S. austinii*, *Leucobryum glaucum* and *Trichophorum germanicum* cover; increase in *Sphagnum papillosum*, *S. capillifolium* cover; increase in overall *Sphagnum* and *Calluna vulgaris* cover. This quadrat features sub-central vegetation but with flush type species, thus the area has now been mapped as active flush rather than sub-central ecotope. Changes within the quadrat may be 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 active flush throughout the entire bog.

**The Structure & Functions of Active Raised Bog at All Saints Bog are assessed as Favourable-Improving** (see table 8.5).

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#### *Future Prospects*

Although the habitat Area and S&Fs have slightly increased and improved in the 2005-2011 reporting period, considerable changes have also taken place in the habitat's distribution with losses particularly along the northern high bog section. These losses have been accompanied by the expansion of Active Raised Bog along the southern high bog, partially due to vegetation recovery after the 2002/3 fire event but also due to what are likely to be changes in surface water flow patterns on the bog associated with subsidence. This subsidence is likely to be associated with falling water table levels in the underlying mineral subsoil layers caused by the quarrying activity adjacent to the high bog. Peat cutting has caused further subsidence along the northern high bog section resulting in sub-central ecotope losses. Although the activity did not take place in 2012/13, the complete cessation of this activity at the site and that it will not be reinitiated cannot be confirmed.

Furthermore, drainage on the high bog and within the large bare peat area to the northeast continues to damage the habitat hindering its recovery to FRVs.

The 2011 survey noted the spread of *Pinus sylvestris* on many sections across the entire high bog and particularly within the inactive flushes and the drier sections of active flushes and Bog Woodland. Many plants are less than 2m high and are likely to have germinated after the severe fire event that took place in 2002/3. The spread of pines is likely to be an indication of further drying out of the high bog.

Habitat **Area** is currently 72.16% below FRV (see table 8.4). A Decreasing trend is foreseen and therefore Area is expected to remain more than 15% below FRV in two reporting periods (12 years). Thus, habitat’s **Area Future Prospects** are assessed as **Unfavourable Bad-Decreasing**. Habitat’s **S&Fs** are currently 48.45% above FRV (see table 8.4). Although a Declining trend is foreseen, the S&Fs are expected to be above FRV in two reporting periods and thus habitat’s **S&Fs Future Prospects** are assessed as **Favourable-Declining**.

**The overall habitat’s Future Prospects are Unfavourable Bad-Declining** (see table 8.5). Blocking of remaining reduced-functional and functional drains both on the high bog and cutover and cessation of peat cutting is necessary. It is important to reduce the frequency and intensity of fire events to minimise the impact on the area of Active Raised bog. The actual impact of quarrying activity adjacent to the high bog should be assessed.

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

Table 8.1 Changes in Active Raised Bog area

Active Ecotopes	1994/5 <sup>1</sup>	2005 <sup>2</sup>	2005 (amended)	2011	Change (2005-2011)	
	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	%
Sub-central	38.69	9.37	6.83	6.54	(-)0.29	(-)4.25
Active flush	10.44	10.43	16.90	18.90	(+)2.00	(+)11.83
Bog Woodland	17.48	17.41	14.34	14.34	0.00	0.00
<b>Total</b>	<b>66.61</b>	<b>37.21</b>	<b>38.07</b>	<b>39.78</b>	<b>(+)1.71</b>	<b>(+)4.49</b>

<sup>1</sup>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.

<sup>2</sup>2005 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 8.1 includes 2005 figures and 2005 amended figures. The latter shows the ecotope area believed to be present in 2005 after surveying improvements in 2011. The comparison between 2005 (amended) and 2011 illustrates the actual changes in ecotope area in the 2005-2011 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 2011 (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
Sc1	None	Unknown	This specific area was not surveyed in 2005. Thus any ecotope map changes here are due to more comprehensive surveying in 2011, which resulted in a more accurate mapping.	
Sc2	Qsc2	Decreasing	Smaller than mapped in 2005. This change is due drying out process and is also illustrated by the increase in the adjacent Dry Woodland.	Qsc2-slight increase in <i>Sphagnum</i> hollows cover; <i>Sphagnum</i> pools now absent (this could be due to misclassification as pools in 2005); <i>S. austinii</i> , <i>S. magellanicum</i> , <i>L. glaucum</i> , <i>S. subnitens</i> now present; <i>S. cuspidatum</i> absent; decrease on <i>S. capillifolium</i> and <i>S. papillosum</i> ; slight increase in <i>Calluna vulgaris</i> cover.
Sc3	Qsc3	Stable	Slight changes in boundary. Any ecotope map changes here are due to more comprehensive surveying in 2011, which resulted in a more accurate mapping.	Qsc3-reduction in algae, bare peat cover; <i>Sphagnum</i> lawns and pools now absent; <i>S. austinii</i> , <i>S. subnitens</i> , <i>L. glaucum</i> , <i>T. germanicum</i> now present; <i>S. fuscum</i> now absent; slight reduction in <i>S. cuspidatum</i> , <i>S. capillifolium</i> , <i>R. alba</i> and <i>N. ossifragum</i> cover; slight increase in <i>Sphagnum</i> hummocks cover; slight decrease in <i>Sphagnum</i>

				hollows cover; <i>S. fuscum</i> absent but <i>S. austinii</i> present.
<b>Sc4</b>	None	Stable	Smaller than mapped in 2005. This is the result of re-allocating some sections previously mapped sub-central vegetation to active flush.	
<b>Sc5</b>	None	Unknown	This specific area was not surveyed in 2005. Thus any ecotope map changes here are due to more comprehensive surveying in 2011, which resulted in a more accurate mapping.	
<b>Sc6</b>	None	Expanding	Larger than mapped in 2005. Although some sections have recovered since the burn reported in 2002/3, this section seems to be expanding as a result of subsidence.	
<b>Sc7</b>	None	Stable	Smaller than mapped in 2005. This change in ecotope map here are due to more comprehensive surveying in 2011, which resulted in a more accurate mapping.	
<b>Sc8</b>	None	Unknown	This specific area was not surveyed in 2005. Thus any ecotope map changes here are due to more comprehensive surveying in 2011, which resulted in a more accurate mapping.	
<b>Bw1</b>	Qbw4	Stable	Slight changes in boundary. The change in map here is due to more comprehensive surveying in 2011, which resulted in a more accurate mapping. The new map also shows a smaller Bog Woodland section separated from the main Bw1 section.	Qbw4 – New 2011 quadrat

<b>Bw2</b>	Qbw3	Stable	Slight changes in boundary. The change in map here is due to more comprehensive surveying in 2011, which resulted in a more accurate mapping and therefore an improved vegetation map.	Qbw3 – New 2011 quadrat
<b>Bw3&amp;Bw4</b>	Qbw1&Qbw2	Stable	Slight changes in boundary. The change in map here is due to more comprehensive surveying in 2011, which resulted in a more accurate mapping. Bw3&Bw4 consists of 3 separate Bog Woodland sections.	Qbw1&Qbw2 – New 2011 quadrats
<b>F3</b>	None	Stable	This active wooded area is much smaller than mapped in 2005. The change in map here is due to more comprehensive surveying in 2011, which resulted in a more accurate mapping. Some sections within Bw3&Bw3 correspond with F3 vegetation.	
<b>F4</b>	Qsc4	Expanding	Changes in boundary, particularly along south-western section. Some of these changes are the result of more comprehensive surveying in 2011. However, some changes are due to the re-allocation of previously mapped sub-central vegetation to active flush (large section of former Sc4 and former Sc8 now deemed part of F4). The southern section of F4 (surrounding F8) is expanding. This likely to be the result of subsidence.	Qsc3-increase in <i>Sphagnum</i> hummocks and hollows cover; slight decrease in <i>S. austinii</i> , <i>L. glaucum</i> and <i>T. germanicum</i> cover; increase in <i>S. papillosum</i> , <i>S. capillifolium</i> cover; increase in overall <i>Sphagnum</i> and <i>Calluna vulgaris</i> cover.
<b>F5</b>	None	Newly developed	This active flush has developed in a depression in the ground associated with subsidence due to peat cutting.	

F8	None	Stable	This active wooded flush was severely damaged by a fire event in 2002/3 and as a result tree canopy decreased to less than 30% and therefore is no longer deemed Bog Woodland. This change took place prior to reporting period (2005-11)
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### Degraded Raised Bog (7120)

#### Area

The Degraded Raised Bog FRV for Area is 80.08ha at All Saints Bog. This value corresponds with the difference between the current high bog area (222.95ha) and the Active Raised Bog FRV (142.87ha) 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 128.73% bigger than FRV and therefore the habitat Area is given an **Unfavourable Bad** assessment (see table 8.4).

Table 8.3, shows very little change on the area of sub-marginal ecotope in the reporting period. However, some sections previously deemed sub-marginal ecotope are now classed as sub-central (e.g. **Sc6**) while on the other hand some former sub-central areas have degraded to sub-marginal along the northern high bog section (e.g. former **Sc1**). Approximately 2ha of inactive flush are now deemed active after recovery from the fire event in 2002/3 and/or rewetting along the southern section of **F4** associated with potential flow pattern changes.

Table 8.3 indicates that there has been a decrease (2.13ha) in the area of Degraded Raised Bog. The decrease is the result of expansion of Active Raised Bog (1.71ha) and a high bog loss of 0.42ha caused by peat cutting. As a result the habitat is given a **Decreasing** trend.

**The Area of Degraded Raised Bog at All Saints Bog is assessed as Unfavourable Bad-Decreasing** (see table 8.5).

#### Structure & Functions

The FRV for S&Fs is for a maximum 25% of the Degraded Raised Bog area to be made up of marginal and face bank, i.e. the lower quality and drier vegetation communities. This value is 45.79ha (25% of 183.17ha, the current area of Degraded Raised Bog). The current marginal and face bank ecotopes area value (40.62ha) is below FRV (in the particular case of Degraded Raised Bog a current area value equal or smaller than FRV is desirable) (see Table 8.4). Thus S&Fs are assessed as **Favourable**.

Table 8.4 does not show any change in the area of marginal ecotope, however face bank has overall decreased by 0.12ha (0.42ha lost due to peat cutting but also approx. 0.3ha increased along the northern high bog edge as a result of drying out also caused by peat cutting). 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 All Saints Bog are given a **Declining** trend.

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 All Saints Bog are assessed as Favourable-Declining** (see table 8.5).

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#### *Future Prospects*

Degraded Raised Bog has decreased as result of peat cutting. This activity also damaged the habitats S&Fs. Although the activity did not take place in 2012/13, the complete cessation of this activity at the site and that it will not be reinitiated cannot be confirmed. Furthermore, drainage on the high bog and within the large bare peat area to the northeast continues to damage the habitat and to hinder its recovery to FRVs, as well as minimising the chances to convert face bank and marginal ecotope into sub-marginal and/or Active Raised bog. In addition, the quarrying activity to the south of the high bog is probably the reason for changes in water flow patterns within the high bog and is therefore negatively impacting on the habitat.

The 2011 survey noted the spread of *Pinus sylvestris* across many sections of the entire high bog and particularly within the inactive flushes and the drier sections of active flushes and Bog Woodland. Many plants are less than 2m high and likely to have germinated after the severe fire event that took places in 2002/3. The spread of pines is likely to an indication of further high bog drying out.

Habitat **Area** is currently 128.73% above FRV (see table 8.4) and a Decreasing trend is foreseen in the following two reporting periods (12 years) due to the presence of negatively impacting activities. 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 11.30% below FRV (see table 8.4), which is taken as positive. A Declining trend is foreseen in the following two reporting periods. Thus, habitat’s **S&Fs Future Prospects** are assessed as **Favourable-Declining**.

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

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

Table 8.3 Changes in Degraded Raised Bog area

Inactive Ecotopes	1994/5 <sup>1</sup>	2005 <sup>2</sup>	2005 (amended)	2011	Change (2005-2011)	
	Area (ha)	Area (ha)	Area (ha)	Area (ha)	Area (ha)	%
Sub-marginal	76.26	97.04	98.79	98.78	(-)0.01	(-)0.01
Marginal	34.28	30.95	27.55	27.55	0.00	0.00
Face bank	n/a	13.19	13.19	13.07	(-)0.12	(-)0.91
Inactive flush	n/a	8.99	9.77	7.77	(-)2.00	(-)20.47
Damaged (e.g. Bare peat)	49.36	36.00	36.00	36.00	0.00	0.00
<b>Total</b>	<b>162.2</b>	<b>186.17</b>	<b>185.3</b>	<b>183.17</b>	<b>(-)2.13</b>	<b>(-)1.15</b>

<sup>1</sup> 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.

<sup>2</sup> 2005 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 2005 figures and 2005 amended figures. The latter shows the ecotope area believed to be present in 2005 after surveying improvements in 2011. The comparison between 2005 (amended) and 2011 illustrates the actual changes in ecotope area in the 2005-2011 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 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.

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 slightly increased in the reporting period. However, the increase has taken place within active flush vegetation where the habitat is less frequent. Sub-central and sub-marginal ecotope have barely changed in area. Because of the uncertainties involved on assessing any actual change a tentative stable assessment is given. 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 and quarrying on adjacent land continue to threaten 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 generally indirectly based on the Active Raised Bog S&Fs status and trend assessments, as Active Raised Bog supports the finest habitat quality type, which in All Saints Bog has been given a Favourable-Improving assessment. However, this is the result of the increase within active flush vegetation where *Rhynchosporion* depressions are less frequent in the case of All Saints Bog. Therefore, the habitat's S&Fs Future Prospects are given a **Favourable-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 a **Favourable-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 All Saints Bog is assessed as Unfavourable Bad-Declining** (see table 8.5).

## Bog Woodland (91D0)

### *Area*

The favourable reference value (FRV) for Area is 17.48ha at All Saints Bog. The FRV corresponds with the area of this habitat present when the Habitats Directive came into force in 1994 (see table 8.4) and therefore the Kelly *et al.* (1995) value. The current area is 14.34ha and therefore 17.96% below FRV. A current habitat Area value more than 15% below FRV falls into the **Unfavourable Bad** assessment category.

F8 (0.76ha) was previously deemed Bog Woodland, but a 2002/3 fire event severely damaged the woodland and now its canopy is low (<30%) and therefore no longer Bog Woodland. This loss in Bog Woodland took place prior to current reporting period (2005-2011).

The area of Bog Woodland has not changed in the reporting period (see table 8.1) and any change within Bog Woodland between the 2005 and 2011 map seems to be mostly due to a more comprehensive survey in 2011, which resulted in an improved vegetation map. Nevertheless, changes in the middle section of the high bog (surrounding Bw2) and within F6 (likely to have expanded) may be related to drying out processes and the changing water flow patterns within the high bog mentioned previously in this report. Further research is needed to confirm any change. In the absence of any other information to confirm any actual change, the habitat Area is given a **Stable** trend assessment.

**The Area of Bog Woodland at All Saints Bog is assessed as Unfavourable Bad-Stable** (see table 8.5).

### *Structure & Functions*

The FRV for S&Fs is assessed based on the four monitoring stops assessment in 2011 (see Appendix III). All four monitoring stops pass the assessment and therefore the habitat's S&Fs are given a Favourable- Stable assessment. However, additional monitoring stops should have been included in the northwest section of the woodland where drying out processes seem to be taking place.

**The Structure & Functions of Bog Woodland at All Saints Bog are assessed as Favourable-Stable** (see table 8.5).

*Future Prospects*

Impacting activities such as peat cutting, drainage and quarrying on adjacent land are threatening Active and Degraded Raised Bog. Some evidences of potential change (drying out) within Bog Woodland have been recorded (i.e. BW2 and expansion of inactive flush F6).

Habitat **Area** is currently 17.96% below FRV (see table 8.4) and a Decreasing trend is expected 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-Decreasing**. Habitat’s **S&Fs** are also considered to be threatened as drying out processes continue. Thus although FRVs have not been set for the habitat’s S&Fs, this attributes Future Prospects are assessed as **Unfavourable Inadequate-Declining**.

**The overall habitat’s Future Prospects are Unfavourable Bad-Declining** (see table 8.5). It is important to reduce the frequency and intensity of fire events to minimise the impact on the area of Bog Woodland.

**The conservation status of Bog Woodland at All Saints 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) <sup>1</sup>	2011 value (ha) <sup>2</sup>	% below target	FRV 2011 Target (ha) <sup>3</sup>	2011 value (ha) <sup>4</sup>	% above target
<b>7110</b>	142.87	39.78	72.16	12.72	18.9	48.58

Habitat	FRV Target	2011 value	% above	FRV 2011	2011 value	% below
	(ha) <sup>5</sup>	(ha) <sup>6</sup>	target	Target (ha) <sup>7</sup>	(ha) <sup>8</sup>	target
<b>7120</b>	80.08	183.17	128.73	45.79	40.62	11.30

<sup>1</sup>1992 central, sub-central, active flush, bog woodland and sub-marginal ecotope area.  
<sup>2</sup>2011 central, sub-central ecotope, active flush and bog woodland area.  
<sup>3</sup> 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.  
<sup>4</sup>2011 central ecotope and active flush area.  
<sup>5</sup>1992 high bog area minus 7110 area FRV.  
<sup>6</sup>2011 Degraded Raised Bog area.  
<sup>7</sup> 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.  
<sup>8</sup>Current marginal and face bank ecotopes area.

	FRV Target (ha)	2011 value (ha)	% below target	FRV Target (ha)	2011 value (ha)	% change
91D0	17.48	14.34	17.96	na	na	na

na: not applicable

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.**
- **Bog Woodland 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-Increasing	Favourable- Improving	Unfavourable Bad- Declining	Unfavourable Bad- Declining
7120	Unfavourable Bad-Decreasing	Favourable- Declining	Unfavourable Bad- Declining	Unfavourable Bad- Declining
7150	Unfavourable Bad-Stable	Favourable-Stable	Unfavourable Bad- Declining	Unfavourable Bad- Declining
91D0	Unfavourable Bad-Stable	Favourable-Stable	Unfavourable Bad- Declining	Unfavourable Bad- Declining

## Conclusions

### Summary of impacting activities

- Peat cutting still continues at the site and has taken place at 11 locations in the 2005-2011 reporting period. 0.42ha of high bog have been lost in this period due to peat cutting and this activity is considered to be one of the reasons for the decline in Active Raised Bog along the northern section of high bog. More recent information from the NPWS indicates that no cutting took place in 2012-13. However, the complete cessation of this activity at the site and that it will not be reinitiated cannot be confirmed.

- 27km of drains on the high bog remain functional. Most of these are associated with former moss peat exploitation to the northeast of the high bog, but there are also some within the area to the north of F1&F2 (drain complex bF), where running water was noted during the 2011 visit.
- Cutover drainage (peripheral drainage) associated with either currently active or no longer active peat cutting continue to impact on the high bog habitats. In addition, maintenance works have been carried out in the reporting period on drains in agriculture land to the southeast and northeast of the high bog.
- No fire events have damaged the high bog in the reporting period. A severe fire event seriously damaged the southern section of high bog in 2002/3.
- Quarrying is considered to be one of the most threatening activities at the site. Two separate quarries located within 50m and 220m from the high bog have operated to the south of the site. This activity is considered to have played a major role in changes in the high bog hydrology, particularly along the southern high bog section. Thus, quarrying is considered to have had high Importance/Impact on high bog habitats.

#### **Changes in active peat forming areas**

- Although figures indicate a 1.71ha increase in Active Raised bog (mainly within the southern high bog sections and mostly active flush), the distribution of the habitat has changed considerably and habitat losses have taken place (overall 0.29ha of sub-central have been lost). Former Sc1 and Sc10 are no longer present. Further reductions have been reported at **Sc2**.
- Several new peat forming areas (**Sc1**, **Sc5** and **Sc8**) have been described at the site. These new sub-central ecotope areas are the result of a more comprehensive survey in 2011 rather than actual changes in Active Raised Bog.
- The habitat has expanded across the southern high bog section at **Sc6** and **F4** section surrounding **F8**. Although part of this expansion is due to the recovery of the vegetation since the 2002/3 fire event. Part of the expansion is considered to be due to further subsidence. This is likely to be associated with falling water table levels in the underlying mineral subsoil layers caused by quarrying activity adjacent to the high bog. These are likely to be causing changes in the hydrological functioning of the high bog (more water running towards the south) with unpredictable negative consequences on Active Raised

Bog and Bog Woodland. Drying out of higher ground sections such as those near and within F6 may be connected to these hydrological changes.

### Other changes

- Inactive flush (F6) and surrounding area seems to be expanding (drying out).
- The 2011 survey noted the spread of *Pinus sylvestris* on many sections across the entire high bog and particularly within inactive flushes and the drier sections of active flushes and Bog Woodland. Many plants are less than 2m high and likely to have germinated after the severe fire event that took place in 2002/3. The spread of pines is likely to be an indication of further drying out of the high bog.

### Quadrats analysis

- Quadrat **Qsm1** previously was previously classified as **Qsc1**, but the 2005 description already corresponds with sub-marginal/sub-central borderline vegetation. So no major changes noted.
- **Qsc2**: although no major changes noted some evidence of drier conditions have been noted: *Sphagnum cuspidatum* is now absent and there has been an increase in other *Sphagnum* species more typical of hummock conditions.
- Slight changes have been noted in **Qsc3** and **Qsc4**. Some of them may be the result of a potential discrepancy in the quadrat location between both year surveys, rather than actual changes. Permanent markers were inserted in quadrats recorded in 2011.

### 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 All Saints Bog.

### Summary of conservation status

- **Active Raised Bog** has been given an **Unfavourable Bad–Declining** conservation status at All Saints Bog. Habitat Area has slightly increased and quality improved in the reporting period. However both values are below the FRVs. This increase is also associated with significant changes in habitats distribution, including habitat losses, and high bog hydrology as described above. Future Prospects are considered Unfavourable Bad–Declining as impacting activities (peat cutting, drainage and quarrying) continue to threaten the habitat.

- **Bog Woodland** has been given an **Unfavourable Bad-Declining** conservation status at All Saints Bog. Although habitat Area has not changed in the reporting period, it is below the FRV due to losses associated with a fire event in 2002/3. Habitat's S&Fs are considered Favourable-Stable but evidence of drying out processes were noted. Future Prospects are considered Unfavourable Bad-Declining due to threats arising from negatively impacting activities (peat cutting, drainage and quarrying).
- **Degraded Raised Bog** has been given an **Unfavourable Bad-Declining** conservation status at All Saints Bog. Habitat Area has slightly decreased due to an increase in Active raised Bog but also due to losses associated with peat cutting. Habitat's S&Fs have also declined due to peat cutting. Habitat Area is above the FRV. Future Prospects are considered Unfavourable Bad-Declining due to threatening impacting activities.
- **Depressions on peat substrates of the Rhynchosporion** has been given an **Unfavourable Bad-Declining** conservation status at All Saints Bog. Habitat Area and quality (S&Fs) are considered to have not changed 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 **All Saints SAC** is assessed as being **Unfavourable Bad-Declining**.

#### **Recommendations**

- **Cessation of peat cutting.**
- **Assessment of the actual impact of quarrying activity** adjacent to the high bog.
- **Restoration works** including blocking of high bog reduced-functional and functional drains, as well as cutover drains. Further research into the restoration of the former moss peat exploitation area should be carried out, in order to assess its impact on the high bog hydrology and therefore high bog habitats.
- **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 and particularly Bog Woodland (further monitoring stops on the northwest section) in order to assess change in habitat's conservation status.
- **Further restoration works are recommended** including the blocking of any remaining high bog reduced functional drains, and possibly the cutover drains.



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## Appendix I Detailed vegetation description of the high bog

### Active Raised Bog (7110)

#### Sub-Central Ecotope Complexes

##### COMPLEX 9/10

- **Location:** this complex dominates **Sc1, Sc3**, northwest section of **Sc2, Sc4**, northern section of **Sc6, Sc7** and **Sc8**
- **Ground:** very soft
- **Physical indicators:** old hummocks may contain bare peat in places.
- **Calluna height:** 21-30cm
- **Cladonia cover:** 4-10%
- **Macro-topography:** depression or gentle slope
- **Pools:** absent
- **Sphagnum cover:** 51-75%
- **Narthecium cover:** 4-10%
- **Micro-topography:** tall and low hummocks/hollows
- **Tussocks:** *Trichophorum germanicum* (<1%)
- **Degradation or regeneration evidence:** different to each complex 9/10 section described below.
- **Species cover:** *Calluna vulgaris* (11-25%), *Erica tetralix* (11-25%), *Eriophorum angustifolium* (26-33%), *E. vaginatum* (4-10%), *Narthecium ossifragum* (4-10%), *Trichophorum germanicum* (<1%), *Carex panicea* (<4%), *Rhynchospora alba* (<4%), *Andromeda polifolia* (<1%), *Drosera rotundifolia* (<1%), *Sphagnum capillifolium* (Hummocks (H); 4-10%), *S. papillosum* (H; 11-25%), *S. magellanicum* (H; 11-25%), *S. subnitens* (H;<4%), *S. tenellum* (H; <4%), *S. austinii* (H;<1%), *S. cuspidatum* (Hollows (HI);<4%), *Vaccinium oxycoccos* (<1%).
- **Additional comments:**
- **Sc1** firstly recorded in 2011, consists of 34-50% *Sphagnum* cover; high hummocks and hollows and *Eriophorum vaginatum* tussocks (11-25%); *Rhynchospora alba* slightly higher cover (4-10%), and dominant *Sphagnum* species include *S. capillifolium* (H; 4-10%), *S. papillosum* (H & HI; 11-25%), *S. magellanicum* (H; <4%), *S. cuspidatum* (HI; 11-25%).

Complex 9/10 also dominates **Sc2**. This sub-central ecotope sample is slightly smaller than reported in 2005. *Sphagnum magellanicum* hummocks have invaded the hollows. Tall *Calluna vulgaris* (35-50%) and *Eriophorum vaginatum* (26-33%) characterizes the complex. *Rhynchospora*

*alba*, *Eriophorum angustifolium*, *S. capillifolium*, *S. subnitens*, *S. tenellum*, *S. austinii* and *S. fuscum* hummocks are also present. Overall 35-50% *Sphagnum* cover. **Sc2** has some flush type species such as *Empetrum nigrum* and *Molinia caerulea*. Some sections within Sc2 are poorer in *Sphagnum* and correspond to sub-marginal ecotope (complex 9/7). Quadrat **Qsc2** was reported with **Sc2**, but it corresponds to complex 9/7/10 and also features flush type species such as *Aulacomnium palustre*, *Polytrichum commune* var. *commune* and *Vaccinium oxycoccos*.

**Sc3** is also characterised by complex 9/10. Micro-topography consists of low hummocks and hollows. Here *Sphagnum magellanicum* colonized hollows. *Calluna vulgaris* (26-33%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (11-25%), *E. angustifolium* (<4%) and *Carex panicea* (4-10%), but 25% in places) dominated the complex. *Sphagnum papillosum*, *S. austinii*, *S. subnitens* hummocks and *S. cuspidatum* hollows were also reported. **Sc3** has expanded towards the high bog edge to the northwest, where some small drains remain functional. **Sc3** has an overall 50 to 75% *Sphagnum* cover which decreases towards the edge of the complex. **Sc3** was reported as slightly larger towards the northeast.

Former **Sc5** (to the northeast of current **Sc5**) is considered to be sub-marginal ecotope as part of this more recent survey. Only small patches of complex 9/10 (too small to be mapped) were found on this location, particularly on an old in-filled drain. Thus, rather than an actual change on vegetation the loss of Sc5 is due to an improvement on mapping accuracy.

Complex 9/10 is again found at GR 201579/210826. The area is slightly depressed and *Sphagnum magellanicum* hummocks and *Eriophorum vaginatum* characterise the vegetation. *S. capillifolium*, *S. fuscum* and *S. austinii* hummocks were also recorded. Overall *Sphagnum* cover varies from 51 to 75%. This area of sub-central ecotope is part of **Sc6**.

This complex also dominates **Sc7**, which grades into the adjacent active flush.

A new section of 9/10, which is located on a small depression on the ground, was found on the eastern section of the high bog (GR 201915/210793) and was named **Sc8**. This section of the high bog was mapped as sub-marginal ecotope (complex 9 recently burnt) in 2005 and is likely to have regenerated after the severe fire that took place in 2002/3.

#### COMPLEX 4/10

- **Location:** this complex dominates **Sc5** and **Sc6**
- **Ground:** soft
- **Physical indicators:** absent
- **Calluna height:** 20-30cm
- **Cladonia cover:** <4%

- **Macro-topography:** gentle slope
- **Pools:** absent
- **Sphagnum cover:** 51-75% (complex characterized by a thin (<15cm) layer of *Sphagnum*)
- **Narthecium cover:** 4-10%
- **Micro-topography:** low hummocks/ hollows
- **Tussocks:** *Trichophorum germanicum* (<4%)
- **Degradation or regeneration evidence:** depends on each sections
- **Species cover:** *Calluna vulgaris* (4-10%), *Erica tetralix* (11-25%), *Eriophorum vaginatum* (<4%), *E. angustifolium* (<4%), *Narthecium ossifragum* (4-10%), *Trichophorum germanicum* (<4%), *Carex panicea* (4-10%), *Rhynchospora alba* (34-50%), *Andromeda polifolia* (<1%), *Sphagnum capillifolium* (H; 4-10%), *S. papillosum* (H; 34-50%), *S. magellanicum* (H; <4%), *S. subnitens* (H;<4%), *S. austinii* (H;<1%), *S. fuscum* (H;<1%), *S. cuspidatum* (Hl;<4%), *Menyanthes trifoliata* (<1%), *Aulacomnium palustre* (<1%).
- **Additional comments:** Sc6 features pockets of sub-marginal ecotope. Water seems to flow towards the high bog at Sc6. Sub-central ecotope has considerable expanding on this section of high bog. This may be related to the recovery after the 2002/03 burning but also to subsidence associated with a quarry near to high bog, which is likely to have caused a lowering of local water tables.

A new sample of complex 4/10 (Sc5) was recorded to the southwest of former Sc5. This is a shallow depression on the ground. A thin layer of *Sphagnum papillosum* characterise the complex which also feature high cover of *Rhynchospora alba* (26-33%). *S. magellanicum*, *S. subnitens* and *S. austinii* were also recorded. Overall *Sphagnum* cover 50 to 75%.

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#### Active Flushes

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##### FLUSH F3 (FORMER C3)

This active peat forming flush is dominated by scattered *Betula pubescens* trees (up to 5m high). Ground flora consists of *Calluna vulgaris* with high density of *Pleurozium schreberi*. *Sphagnum capillifolium* and *S. fallax* dominate the *Sphagnum* layer which cover is 51 to 75%. Other species reported include *Erica tetralix*, *Andromeda polifolia*, *Molinia caerulea*, *Dryopteris carthusiana*, *Blechnum spicant* *Hylocomium splendens*, *Thuidium tamariscinum* and *Aulacomnium palustre*. Where the canopy of *B. pubescens* increase to more than 30% the area is considered to be Bog Woodland and therefore is mapped as **Bw3&Bw4**.

#### FLUSH F4 (FORMER C4)

The eastern section of **F4** feature very similar species than those described for the adjacent **D4** (considered Bog Woodland), but it is characterised by a low tree canopy. Trees reach up to 9m height. This section of F4 contains a dense *Pinus sylvestris* regeneration (20 plants (<2m) in a 5x5m section) (GR 201781/211086).

The high bog section to the north of **F3** (former **C3**) is an **inactive flush** characterised by tall *Calluna vulgaris* (up to 1m high) and scattered *Pinus sylvestris* and *Betula pubescens*. The ground has many deep cracks and functional drains which continue drying out the high bog. There is a section where *Pinus sylvestris* canopy increases and thus is classified as a dry Woodland (GR 201667/211183). Trees are up to 8m high, the ground is dry and firm and the overall *Sphagnum* (*S. palustre*, *S. capillifolium*, *S. fallax*) cover under these trees is low (11-25%). Other bryophytes recorded include *Hypnum jutlandicum* and *Hylocomium splendens*. The northwest section of this inactive flush (GR 201585/211332) is wooded with up to 4m high pines. Understory consists of tall *C. vulgaris*, *Empetrum nigrum*, *Eriophorum vaginatum*, *Vaccinium oxycoccos*, *Aulacomnium palustre*, *Polytrichum commune* var. *commune*. Overall *Sphagnum* cover is 11 to 25%.

Southern section of **F4** (GR 201155/211143) feature a high density of pine (<1m), likely to have spread since the 2002/3 burn.

The southern section of **F4** also features inactive areas where tall *Calluna vulgaris* (50-75%) dominate along with *Molinia caerulea* (4-10%), and *Eriophorum vaginatum* (4-10%). The overall *Sphagnum* cover is low (11-25%) and mostly consists of *S. capillifolium*, *S. palustre* and *S. fallax*. Another sample of Pine dominated Dry Woodland is found on this location (GR 201340/211102). Pines reach 7m and the overall *Sphagnum* cover is low (11-25%). Tall *C. vulgaris*, *Betula pubescens* and *Vaccinium myrtillus* and characterise the understory flora.

Northern section of **F4** (GR 211649/201045) consists of tall *Calluna vulgaris* (26-33%), *Eriophorum vaginatum* (26-33%), *Empetrum nigrum* (11-25%), *Osmunda regalis* (<4%), *Sphagnum capillifolium* (1-25%), *S. palustre* (4-10%), *S. fallax* (11-25%) and *Polytrichum commune* var. *commune*. Overall 34-50% *Sphagnum* cover. Scattered *Pinus sylvestris* and *Betula pubescens* trees are also present.

#### FLUSH F5

This is a small flush located on a narrow depression (GR 211694/201127) to the north of **Bw1**. This flush may have develop as a result of subsidence associated to the peat cutting activity to the NW of this flush, where slumping and high subsidence have taken place. **F5** Is characterised by high cover of *Eriophorum vaginatum* (34-50%), *Empetrum nigrum* (34-50%) along with *Calluna vulgaris* (11-25%),

*Erica tetralix* (4-10%), *Vaccinium oxycoccos* (<1%) and *Andromeda polifolia* (<1%). Overall *Sphagnum* cover within the flush is 51 to 75% and mostly consists of *S. capillifolium* and some *S. palustre* and *S. papillosum*.

#### FLUSH F8 (FORMER D5)

This a wooded flush previously mapped as Bog woodland, but with too low tree (up to 5m high) canopy (<30%) to be considered woodland. This area was severely damaged during the fire that took place in 2002/3 and most of adult trees are currently dead and some remain standing. Therefore, this area that was likely to correspond with Bog Woodland prior to the fire event should have been already classified as active peat forming wooded flush in the 2005 survey already. *Pinus sylvestris* dominate the tree layer and has regenerated rather prolifically since the 2002/3 fire event with many plants (<1.5m) found. *Betula pubescens* less than 2m high trees also found scattered across the wooded section. The southern section of this flush is not wooded and consists of typical 9/7/10 complex vegetation (sub-central ecotope) dominated by *Sphagnum capillifolium* hummocks and *Eriophorum vaginatum* but with many flush type species such as *Aulacomnium palustre*, *Vaccinium oxycoccos*, *Empetrum nigrum* and *Polytrichum commune*. Overall *Sphagnum* cover across the flush range from 51 to 75%. Other species recorded within the flush include *Calluna vulgaris*, *Erica tetralix*, *Eriophorum angustifolium*, *Molinia caerulea*, *Osmunda regalis*, *Andromeda polifolia*, *Hypnum jutlandicum*, *Pseudoscleropodium purum* and *Leucobryum glaucum*. Former **Sc8** is also considered to be part of this flush and is no longer classified as sub-central ecotope. This section of the flush contain *Sphagnum cuspidatum* hollows with *Menyanthes trifoliata* and *S. papillosum* *S. austinii* hummocks.

### Degraded Raised Bog (7120)

#### Sub-Marginal Ecotope Complexes

##### COMPLEX 9/7/6 +P

- **Location:** this complex is found across northern section of high bog (e.g. where former Sc1 (2005) was present) and to the south of **Sc3**
- **Ground:** firm to soft
- **Physical indicators:** bare peat (<4%)
- **Calluna height:** 30-40cm
- **Cladonia cover:** 4-10%
- **Macro-topography:** flat

- **Pools:** regular (4-10%)
- **Sphagnum cover:** 11-25%
- **Narthecium cover:** 4-10%
- **Micro-topography:** High and low hummocks/*Narthecium ossifragum* flats/pools/hollows
- **Tussocks:** *Eriophorum vaginatum* (4-10%)
- **Degradation or regeneration evidence:** this complex dominates an area previously mapped as sub-central ecotope **Sc1**. A small patch of sub-central ecotope was also mapped in 2005 to the northeast of Sc1. This area currently corresponds to sub-marginal ecotope (9/7/6 complex). Some *Sphagnum austinii*, *S. capillifolium* and *S. magellanicum* hummocks were reported. But overall the *Sphagnum* cover is low and thus is deemed sub-marginal ecotope. This area is likely to be getting drier as the loss of sub-central ecotope suggests.
- Where the cover of *Carex panicea* increases the complex is named 9/7/3+P.
- **Species cover:** *Calluna vulgaris* (11-25%), *Erica tetralix* (11-25%), *Eriophorum vaginatum* (4-10%), *E. angustifolium* (<4%), *Narthecium ossifragum* (4-10%), *Carex panicea* (<4%), *Rhynchospora alba* (<4%), *Menyanthes trifoliata* (<1%), *Andromeda polifolia* (<1%), *Drosera rotundifolia* (<1%), *Sphagnum capillifolium* (H; 4-10%), *S. papillosum* (H; 4-10%), *S. magellanicum* (H; 4-10%), *S. tenellum* (H; <4%), *S. subnitens* (H; <4%), *S. austinii* (H;<4%), *S. cuspidatum* (Pools (P);<4%).
- **Additional comments:** Some sections within the formerly mapped Sc1 have higher *C. vulgaris* cover (34-50%) and *E. vaginatum* (11-25%) and lower *N. ossifragum* (<4%).

#### COMPLEX 9/7

- **Location:** this complex is found in small pockets across the entire high bog, but is more abundant to the north where former Sc1 (2005) was present
- **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:** 4-10%
- **Micro-topography:** low hummocks/hollows
- **Tussocks:** *Trichophorum germanicum* (<4%)

- **Degradation or regeneration evidence:** some section may have recovered after the 2002/3 severe fire
- **Species cover:** *Calluna vulgaris* (11-25%), *Erica tetralix* (11-25%), *Eriophorum vaginatum* (11-25%), *E. angustifolium* (<4%), *Narthecium ossifragum* (11-25%), *Trichophorum germanicum* (<4%), *Carex panicea* (<4%), *Andromeda polifolia* (<1%), *Drosera rotundifolia* (<1%), *Sphagnum capillifolium* (H; 4-10%), *S. papillosum* (H; 11-25%), *S. tenellum* (H; <4%), *S. subnitens* (H; <4%), *S. magellanicum* (H; 4-10%), *S. cuspidatum* (HI; <4%), *Leucobryum glaucum* (<1%).
- **Additional comments:** *Eriophorum vaginatum* cover increase in some place, here the complex is named **9a/7**. Where *Carex panicea* cover reaches 25-33% the complex is named **9a/7/3**. This complex was also recorded where former Sc1 was described (GR 201227/211494). Here the complex consists of high hummocks, low hummocks and hollows. *Sphagnum capillifolium* hummocks, *S. cuspidatum* hollows with *Rhynchospora alba* characterise the complex. *Calluna vulgaris* (35-50%), *Eriophorum vaginatum* (11-25%), *Sphagnum tenellum* and *S. austinii* were also common. Overall 25-33% *Sphagnum* cover. Where pools are recorded the complex is named **9/7+P**. The pools consist mostly of algae, *Sphagnum cuspidatum*, *Rhynchospora alba* and *S. magellanicum*, *S. papillosum*, *S. austinii* hummocks at the edges and invading the pools.

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#### COMPLEX 9/7/6

- **Location:** this is the most widespread sub-marginal complex on the 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/*Narthecium ossifragum* flats/hollows
- **Tussocks:** *Trichophorum germanicum* (<4%)
- **Degradation or regeneration evidence:** none
- **Species cover:** *Calluna vulgaris* (11-25%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (4-10%), *E. angustifolium* (<4%), *Narthecium ossifragum* (26-33%), *Trichophorum germanicum* (<4%), *Carex panicea* (4-10%), *Andromeda polifolia* (<1%), *Drosera rotundifolia* (<1%), *Sphagnum capillifolium* (H;



4-10%), *S. papillosum* (H; 4-10%), *S. tenellum* (H; <4%), *S. subnitens* (H; <4%), *S. austinii* (H;<4%), *S. fuscum* (H;<4%), *S. cuspidatum* (Hl;<4%)

- **Additional comments:** the robustness and cover of *C. vulgaris* increases in the northeast section of the high bog where this complex was reported (GR 201556/211409).

Where *Carex panicea* becomes abundant (southeast of high bog) complex is named 9/7/3. Very occasionally *Eriophorum angustifolium* becomes abundant (north of Sc6) within the latter and complex is named 9a/7/3.

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#### COMPLEX 3/6/4

- **Location:** this is the most widespread sub-marginal ecotope complex across southern high bog section
- **Ground:** soft
- **Physical indicators:** bare peat (<4%), *Campylopus introflexus* (<4%)
- **Calluna height:** 20-30cm
- **Cladonia cover:** <4%
- **Macro-topography:** gentle slope
- **Pools:** absent
- **Sphagnum cover:** 11-33%
- **Narthecium cover:** 11-25%
- **Micro-topography:** low hummocks/hollows
- **Tussocks:** *Trichophorum germanicum* (<4%)
- **Degradation or regeneration evidence:** some section may have recovered after the 2002/3 severe fire
- **Species cover:** *Calluna vulgaris* (4-10%), *Erica tetralix* (11-25%), *Eriophorum vaginatum* (<4%), *E. angustifolium* (<4%), *Narthecium ossifragum* (11-25%), *Trichophorum germanicum* (<4%), *Carex panicea* (11-25%), *Rhynchospora alba* (11-25%), *Andromeda polifolia* (<1%), *Drosera rotundifolia* (<1%), *Sphagnum capillifolium* (H; 4-10%), *S. papillosum* (H; 11-25%), *S. tenellum* (H; <4%), *S. subnitens* (H; <4%), *S. magellanicum* (H; 4-10%), *S. cuspidatum* (Hl; <4%), *Leucobryum glaucum* (<1%).
- **Additional comments:** complex 3/6/4 seems to be expanding towards high bog edge along the southwest section of the site, where the slope is relatively steep.

Those areas along the southwest section of high bog where tear pools are found are named 3/6/4+TP.

Quadrat **Qsc1** was recorded within former **Sc1**. Now consists of complex 9/7. Qsc1 is surrounded by drier vegetation 9/7/6+P and 9/7/6.

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#### COMPLEX 6/7

- **Location:** this complex is found across northwest section of high bog
- **Ground:** firm to soft
- **Physical indicators:** bare peat (<4%)
- **Calluna height:** 10-20cm
- **Cladonia cover:** <4%
- **Macro-topography:** gentle slope
- **Pools:** absent
- **Sphagnum cover:** 11-25%
- **Narthecium cover:** 26-33%
- **Micro-topography:** Low hummocks/*Narthecium ossifragum* flats/hollows
- **Tussocks:** *Trichophorum germanicum* (<4%)
- **Degradation or regeneration evidence:** none
- **Species cover:** *Calluna vulgaris* (11-25%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (<4%), *E. angustifolium* (<4%), *Narthecium ossifragum* (11-25%), *Trichophorum germanicum* (<4%), *Carex panicea* (4-10%), *Rhynchospora alba* (<4%), *Sphagnum capillifolium* (H; <4%), *S. tenellum* (H; <4%), *S. subnitens* (H; <4%), *S. papillosum* (H;<4%), *S. magellanicum* (H;<4%), *Leucobryum glaucum* (<1%).
- **Additional comments:** none

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#### COMPLEX 6/3

- **Location:** this complex is found on three main location on high bog: to east of **Sc7**; surrounding **Sc6** and north of **F4**
- **Ground:** soft
- **Physical indicators:** bare peat (<4%), *Campylopus introflexus* (up to 25% in places)
- **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/*Narthecium ossifragum* and *Carex panicea* flats/hollows
- **Tussocks:** *Trichophorum germanicum* (<4%)
- **Degradation or regeneration evidence:** none
- **Species cover:** *Calluna vulgaris* (11-25%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (<4%), *E. angustifolium* (<4%), *Narthecium ossifragum* (26-33%), *Trichophorum germanicum* (<4%), *Carex panicea* (11-25%), *Rhynchospora alba* (<4%), *Andromeda polifolia* (<1%), *Drosera rotundifolia* (<1%), *Sphagnum capillifolium* (H; 4-10%), *S. tenellum* (H; <4%), *S. subnitens* (H; <4%), *S. papillosum* (H;<4%), *S. magellanicum* (H;<4%), *S. austinii* (H;<1%), *Leucobryum glaucum* (<1%).
- **Additional comments:** none

#### COMPLEX 7/9

- **Location:** this complex is found on the northeast section of high bog
- **Ground:** firm to soft
- **Physical indicators:** absent
- **Calluna height:** 41-50cm
- **Cladonia cover:** 26-33%
- **Macro-topography:** gentle slope
- **Pools:** absent
- **Sphagnum cover:** 11-25%
- **Narthecium cover:** 4-10%
- **Micro- topography:** High hummocks/hollows
- **Tussocks:** *Eriophorum vaginatum* (11-25%)
- **Degradation or regeneration evidence:** absent
- **Species cover:** *Calluna vulgaris* (51-75%), *Erica tetralix* (4-10%), *Eriophorum vaginatum* (11-25%), *Narthecium ossifragum* (4-10%), *Empetrum nigrum* (11-25%), *Vaccinium oxycoccos* (4-10%), *Sphagnum capillifolium* (H; 11-25%), *S. tenellum* (H; <4%), *Hylocomium splendens* (<4%), *Hypnum jutlandicum* (4-10%), *Pleurozium schreberi* (<4%), *Pseudoscleropodium purum* (4-10%).
- **Additional comments:** A number of *Pinus sylvestris* mostly 1-2m tall (but up to 4m) occur within this complex.

This complex also features scattered *Pinus sylvestris* trees up to 5m tall in to the north of D2.

Some pines regeneration was also noted at this location, but not as vigorous as within F4. This northern section of the bog was not affected by the 2002/3 fire event.

Where *Cladonia portentosa* becomes abundant complex is named 7/9+Cl described.

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Marginal Ecotope Complexes

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COMPLEX 3/6

- **Location:** this is the most widespread marginal ecotope complex at the site and thus is found across the entire high bog edge
- **Ground:** firm
- **Physical indicators:** bare peat (<4%), *Campylopus introflexus* (up to 50% in places)
- **Calluna height:** 20-30cm
- **Cladonia cover:** 4-10%
- **Macro-topography:** gentle to steep slope
- **Pools:** absent
- **Sphagnum cover:** 4-10%
- **Narthecium cover:** 11-25%
- **Micro-topography:** Low hummocks/*Narthecium ossifragum* flats/hollows
- **Tussocks:** *Trichophorum germanicum* (<4%)
- **Degradation or regeneration evidence:** absent
- **Species cover:** *Calluna vulgaris* (11-25%), *Erica tetralix* (11-25%), *Eriophorum vaginatum* (<4%), *E. angustifolium* (<4%), *Narthecium ossifragum* (11-25%), *Trichophorum germanicum* (<4%), *Carex panicea* (11-25%), *Andromeda polifolia* (<1%), *Sphagnum capillifolium* (H; <4%), *S. tenellum* (H; <4%), *S. subnitens* (H; <4%), *S. papillosum* (H;<4%), *S. magellanicum* (H;<4%), *Leucobryum glaucum* (<1%), *Cladonia floerkeana* (<1%).
- **Additional comments:** This complex is found along the southwest section of the high bog. Here *Rhynchospora alba* dominated runoff channels were found near the high bog edge. Thus, *R. alba* cover reaches 33%. Those areas where tear pools are found are named 3/6+TP. Pool are mainly open water and some *Sphagnum cuspidatum* and *Rhynchospora alba*.

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COMPLEX 7/2

- **Location:** this complex is found on different location to the north and south of high bog edge, as well as on mound to west of F7
- **Ground:** firm
- **Physical indicators:** bare peat (4-10%), *Campylopus introflexus* (4-10%)
- **Calluna height:** 20-30cm
- **Cladonia cover:** <4%
- **Macro-topography:** steep slope

- **Pools:** absent
- **Sphagnum cover:** up to 10%
- **Narthecium cover:** 4-10%
- **Micro-topography:** Low hummocks/*Trichophorum germanicum* tussocks/hollows
- **Tussocks:** *Trichophorum germanicum* (4-10%)
- **Degradation or regeneration evidence:** absent
- **Species cover:** *Calluna vulgaris* (11-25%), *Erica tetralix* (26-33%), *Eriophorum vaginatum* (<4%), *E. angustifolium* (<4%), *Narthecium ossifragum* (4-10%), *Trichophorum germanicum* (4-10%), *Carex panicea* (<4%), *Rhynchospora alba* (<4%), *Andromeda polifolia* (<1%), *Drosera rotundifolia* (<1%), *Sphagnum capillifolium* (H; <4%), *S. tenellum* (H; <4%), *S. subnitens* (H; <4%), *S. papillosum* (H;<4%).
- **Additional comments:** none

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### Facebank Complexes

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#### COMPLEX 1

- **Location:** this complex was found mainly along high bog edge
- **Ground:** firm
- **Physical indicators:** bare peat variable but generally less than 4%, *Campylopus introflexus* (<4%)
- **Calluna height:** 75cm
- **Cladonia cover:** <4%
- **Macro-topography:** steep slope
- **Pools:** absent
- **Sphagnum cover:** 4-10%
- **Narthecium cover:** <4%
- **Micro- topography:** Tall *Calluna vulgaris*/low hummocks
- **Tussocks:** *Trichophorum germanicum* (<4%)
- **Degradation or regeneration evidence:** absent
- **Species cover:** *Calluna vulgaris* (76-90%), *Erica tetralix* (<4%), *Eriophorum vaginatum* (<4%), *E. angustifolium* (<4%), *Rhynchospora alba* (<4%), *Trichophorum germanicum* (<1%), *Vaccinium oxycoccos* (<4%), *Sphagnum capillifolium* (H; <4%), *S. tenellum* (H; <4%), *Hypnum jutlandicum* (<4%), *Hylocomium splendens* (<1%).
- **Additional comments:** none

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## Inactive Flushes

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### FLUSH F1&F2 (FORMER C1&C2)

This is a Dry Woodland dominated by tall *Pinus sylvestris* laying on what is likely to be a mineral ridge. The ground is firm and covered on pine needles with low *Sphagnum* cover (<10%). Understory consists mostly of *Betula pubescens* and *Pteridium aquilinum*.

The section of F1 located to the north of Bw3&Bw4 (GR 201420/211140) consists of tall and robust *Calluna vulgaris* on firm ground. The overall *Sphagnum* cover (mostly *S. capillifolium*) is low (11-25%). This area was burnt in the past and *Pinus sylvestris* is regenerating quite well as the abundance of plants indicates. Scattered taller (up to 4m) pines are also present within this section. This section of F1 also includes an area (GR 201381/211150) dominated by dense *Pteridium aquilinum*.

Another sample of Dry Woodland dominated by tall (up to 5m) pines is also recorded to the north of F1. Tree canopy is approximately 40%. Scrub layer consists mostly of *Betula pubescens* (<2m). Understory consists of *Calluna vulgaris* (50-75%), *Empetrum nigrum* (11-25%), *Eriophorum vaginatum* (4-10%), *Andromeda polifolia*, *Vaccinium myrtillus*, *V. oxycoccos*, *Sphagnum capillifolium*, *Hylocomium splendens* and *Pseudoscleropodium purum*. Overall *Sphagnum* cover is 4-10%.

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### FLUSH F4 (FORMER C4)

This large active flush has wooded and none wooded sections. Some sections of former Sc4 have been re-allocated to this active flush due to the presence of flush type species. In addition some sections formerly mapped as Bog Woodland are now considered to be wooded flush rather than Bog Woodland, due to the low tree density (<30%).

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### FLUSH F6

This is another section of inactive flush and Dry Woodland on the northern section of the High bog (GR 200755/211368). Dry Woodland is dominated by *Pinus sylvestris* (up to 5m). Understory consists of *Calluna vulgaris*, *Molinia caerulea* and features low *Sphagnum* cover (11-25%), mostly *S. palustre*. This Woodland is linked to an inactive flush area already reported in 2005. The ground on this section is slightly higher and drier. A mineral ridge is likely to lay under F6. Those sections with canopy lower than 30% are considered to be wooded flush.

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### FLUSH 7

- **Location:** northwest of high bog

- **Ground:** firm
- **Physical indicators:** absent
- **Calluna height:** 61-70cm
- **Cladonia cover:** 4-10% (11-25% in places)
- **Macro-topography:** elevated ridge
- **Pools:** absent
- **Sphagnum cover:** 11-25%
- **Narthecium cover:** absent
- **Micro- topography:** Tall *Calluna* hummocks
- **Tussocks:** absent
- **Degradation or regeneration evidence:** absent
- **Species cover:** *Calluna vulgaris* (75-90%), *Phragmites australis* (11-25%), *Eriophorum vaginatum* (<4%), *Andromeda polifolia* (<4%), *Dryopteris* spp. (<4%), *Vaccinium oxycoccos* (4-10%), *Sphagnum capillifolium* (H; 4-10%), *S. subnitens* (H; <4%), *S. palustre* (H; <4%), *Hylocomium splendens* (4-10%), *Hypnum jutlandicum* (11-25%), *Aulacomnium palustre* (4-10%), *Leucobryum glaucum* (<4%), *Dicranum scoparium* (<4%).
- **Additional comments:** The southern extent of this flush is wetter and softer underfoot and supports ca. 8-10 *Betula pubescens* of 2.5 - 3m tall. There is also a higher *Sphagnum* cover in this area and small patches of *S. cuspidatum* (<4%).

## Bog Woodland (91D0)

### Bog Woodland Bw1

This Bog Woodland contains areas dominated by *Pinus sylvestris* and others by *Betula pubescens*.

Those areas dominated by *B. pubescens* feature a ground flora consisting of abundant *Eriophorum vaginatum* and other species such as *Salix aurita*, (as a low shrub layer) *Calluna vulgaris*, *Erica tetralix*, *Vaccinium myrtillus*, *V. oxycoccos*, *Juncus effusus*, *Dryopteris carthusiana*, *Sphagnum capillifolium*, *S. palustre*, *S. fimbriatum*, *S. papillosum*, *S. fallax*, *Aulacomnium palustre*, *Hypnum jutlandicum*, *Pseudoscleropodium purum*, *Hylocomium splendens*, *Polytrichum commune var. commune* and *Rhytidiadelphus squarrosus*.

Northern section of **Bw1** is dominated by pines (up to 4m). Ground flora consists of 35-50% *Sphagnum* (*S. capillifolium*, *S. palustre*, *S. papillosum*). *Calluna vulgaris*, *Empetrum nigrum* and *Eriophorum vaginatum* characterise the vegetation on this location.

Quadrat **Qbw4** was taken within **Bw1**.

### Bog Woodland Bw2

This Bog Woodland is dominated by *Pinus* trees, which are up to 6m high. The bryophyte layer feature high cover of *Sphagnum* species.

Quadrat **Qbw3** was taken within **Bw2**.

### Bog Woodland Bw3&Bw4

The eastern section of **Bw4** features *Pinus sylvestris* trees, up to 7m high, and understory of *Betula pubescens* trees (<2m high). The ground flora is dominated by *Calluna vulgaris* (25-33%), *Erica tetralix* (4-10%) and *Eriophorum vaginatum* (35-50%). Other species recorded include *Salix aurita*, *Empetrum nigrum*, *Vaccinium myrtillus*, *Andromeda polifolia*, *Vaccinium oxycoccos*, *Potentilla erecta*, *Juncus effusus*, *Osmunda regalis* and *Dryopteris carthusiana*, *Sphagnum capillifolium*, *S. palustre*, *S. papillosum*, *S. fallax*, *S. austinii*, *Pleurozium schreberi*, *Aulacomnium palustre*, *Hypnum jutlandicum*, *Pseudoscleropodium purum*, *Hylocomium splendens*, *Polytrichum commune* var. *commune*, *Peltigera membranacea*. Overall *Sphagnum* cover in this section of the Bog Woodland varies from 51 to 75%.

Quadrats **Qbw1&2** were taken within **Bw4**. Tree density within the woodland increases in many sections such as where **Qbw2** was recorded.

### Depressions on peat substrates of the Rhynchosporion (7150)

The habitat occurs at All Saints 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 in All Saints Bog, such as: sub-central ecotope (9/10; 4/10); sub-marginal ecotope (9/7/6 +P; 9/7; 3/6/4; 6/7; 6/3), marginal ecotope (3/6;7/2) and face bank ecotope (1).

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

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



## Appendix II Photographical records

Photograph Number	Aspect	Type	Feature	Date
102-0490	SW	Overview	Qbw2	05/10/2011
102-0493	NW	Overview	Qbw3	05/10/2011
102-0496	N	Overview	Qbw4	05/10/2011
102-0498	S	Overview	Qsm1	06/10/2011
102-0502	NE	Overview	Qsc2	06/10/2011
102-0503	E	Overview	Qsc3	06/10/2011
102-0497	S	Overview	Qsc4	05/10/2011

## Appendix III Quadrats

Ecotope type	Sub-central	Sub-marginal	Sub-central	Sub-central
<b>Complex Name</b>	9/10	9/7	9/10	9/7/10
<b>Quadrat Name</b>	Qsc1	Qsm1	Qsc2	Qsc2
<b>Easting</b>	201137	201135	200650	200648
<b>Northing</b>	211445	211444	211322	211323
<b>Firmness</b>	Firm-soft	Soft	Soft	Soft
<b>Burnt</b>	No	No	No	No
<b>Algae in hollows %</b>	4-10	Absent	Absent	Absent
<b>Algae in pools %</b>	Absent	Absent	Absent	Absent
<b>Bare peat %</b>	4-10	Absent	Absent	Absent
<b>High hummocks %</b>	Na	4-10	na	34-50
<b>Low hummocks %</b>	11-25	34-50	34-50	26-33
<b>Hollows %</b>	1-3 (many indiv)	26-33	na	11-25
<b>Lawns %</b>	Absent	Absent	Absent	Absent
<b>Pools %</b>	4-10	Absent	1-3 (many indiv)	Absent
<b>Pool type</b>	Regular	Absent	Absent	Absent
<b>S.austinii hum type</b>	Na	Active	Absent	Relic
<b>S.austinii hum %</b>	4-10	4-10	Absent	1-3 (many indiv)
<b>S.austinii height(cm)</b>	Na	21-30	Absent	21-30
<b>S.fuscum hum type</b>	Absent	Absent	Absent	Absent
<b>S.fuscum hum %</b>	Absent	Absent	Absent	Absent
<b>S.fuscum height(cm)</b>	Absent	Absent	Absent	Absent
<b>Leucobryum glaucum</b>	Absent	Absent	Absent	1-3 (many indiv)
<b>Trichophorum type</b>	Tussocks	Absent	Absent	Absent
<b>Trichophorum %</b>	4-10	Absent	Absent	Absent
<b>S.magellanicum %</b>	Absent	Absent	Absent	1-3 (many indiv)
<b>S.cuspidatum %</b>	4-10	4-10	4-10	Absent
<b>S.papillosum %</b>	Absent	1-3 (many indiv)	4-10	1-3 (many indiv)
<b>S.denticulatum %</b>	Absent	Absent	Absent	Absent
<b>S.capillifolium%</b>	4-10	4-10	26-33	11-25

<b>S.tenellum %</b>	Na	4-10	na	4-10
<b>S.subnitens %</b>	Absent	1-3 (many indiv)	Absent	1-3 (many indiv)
<b>R.fusca %</b>	Absent	Absent	Absent	Absent
<b>R.alba %</b>	4-10	1-3 (many indiv)	Absent	Absent
<b>N.ossifragum %</b>	1-3 (many indiv)	1-3 (many indiv)	Absent	Absent
<b>Sphag pools %</b>	4-10	Absent	1-3 (many indiv)	Absent
<b>Dominant pool Sphag</b>	S. cuspidatum		S. cuspidatum	
<b>Sphag lawns %</b>	Absent	Absent	Absent	Absent
<b>Sphag humm %</b>	11-25	11-25	34-50	34-50
<b>Sphag holl %</b>	1-3 (many indiv)	11-25	na	1-3 (many indiv)
<b>Total Sphag %</b>	34-50	34-50	34-50	34-50
<b>Hummocks indicators</b>	S. austinii	S. austinii		S. austinii
<b>Cladonia portent %</b>	4-10	11-25	11-25	4-10
<b>Other Cladonia sp</b>	Absent		Absent	
<b>C. panicea %</b>	Absent	Absent	Absent	Absent
<b>Calluna cover %</b>	34-50	34-50	26-33	51-75
<b>Calluna height(cm)</b>	31-40	21-30	31-40	41-50
<b>Other NotableSpecies</b>	Vaccinium oxycoccos, Andromeda polifolia	Emergent Sphagnum cusp <4%. Vaccinium oxycoccos <4. Dicranum		A. palustre, E. nigrum, Polytrichum commune, V. oxycoccos
<b>Other comment</b>		Borderline SC/SM quad but SM outside (Previously Qsc1)		Borderline ecotope
<b>Date</b>	10/02/2005	06/10/2011	10/02/2005	06/10/2011
<b>Ecotope type</b>	Sub-central	Sub-central	Sub-central	Sub-central
<b>Complex Name</b>	9/10	9/10	9/10 + rb	9/10
<b>Quadrat Name</b>	Qsc3	Qsc3	Qsc4	Qsc4
<b>Easting</b>	200628	200629	200886	200889
<b>Northing</b>	211722	211722	211105	211108
<b>Firmness</b>	Very soft	Very soft	Very soft	Very soft
<b>Burnt</b>	No	No	Yes (2002/03)	No

<b>Algae in hollows %</b>	4-10	Absent	4-10	Absent
<b>Algae in pools %</b>	4-10	Absent	Absent	Absent
<b>Bare peat %</b>	4-10	1-3 (many indiv)	1-3 (many indiv)	Absent
<b>High hummocks %</b>	na	26-33	na	Absent
<b>Low hummocks %</b>	26-33	34-50	11-25	51-75
<b>Hollows %</b>	11-25	11-25	4-10	26-33
<b>Lawns %</b>	4-10	Absent	Absent	Absent
<b>Pools %</b>	1-3 (many indiv)	Absent	Absent	Absent
<b>Pool type</b>	Regular	Absent	Absent	Absent
<b>S.austinii hum type</b>	Absent	Active	na	Active
<b>S.austinii hum %</b>	Absent	1-3 (many indiv)	4-10	1-3 (many indiv)
<b>S.austinii height(cm)</b>	Absent	11-20	na	21-30
<b>S.fuscum hum type</b>	na	Absent	Absent	Absent
<b>S.fuscum hum %</b>	4-10	Absent	Absent	Absent
<b>S.fuscum height(cm)</b>	na	Absent	Absent	Absent
<b>Leucobryum glaucum</b>	Absent	1-3 (many indiv)	4-10	1-3 (many indiv)
<b>Trichophorum type</b>	Absent	Tussocks	Tussocks	Tussocks
<b>Trichophorum %</b>	Absent	1-3 (many indiv)	4-10	1-3 (many indiv)
<b>S.magellanicum %</b>	4-10	4-10	4-10	4-10
<b>S.cuspidatum %</b>	4-10	1-3 (many indiv)	Absent	Absent
<b>S.papillosum %</b>	4-10	4-10	11-25	34-50
<b>S.denticulatum %</b>	Absent	Absent	Absent	Absent
<b>S.capillifolium%</b>	11-25	4-10	4-10	26-33
<b>S.tenellum %</b>	na	4-10	na	Absent
<b>S.subnitens %</b>	Absent	1-3 (many indiv)	na	1-3 (many indiv)
<b>R.fusca %</b>	Absent	Absent	Absent	Absent
<b>R.alba %</b>	4-10	1-3 (several indiv)	Absent	Absent
<b>N.ossifragum %</b>	4-10	1-3 (many indiv)	1-3 (many indiv)	1-3 (many indiv)
<b>Sphag pools %</b>	1-3 (many indiv)	Absent	Absent	Absent
<b>Dominant pool Sphag</b>	S. cuspidatum			
<b>Sphag lawns %</b>	4-10	Absent	Absent	Absent
<b>Sphag humm %</b>	26-33	34-50	11-25	51-75
<b>Sphag holl %</b>	11-25	1-3 (many indiv)	4-10	11-25

<b>Total Sphag %</b>	34-50	34-50	26-33	51-75
<b>Hummocks indicators</b>	<i>S. fuscum</i>	<i>S. austinii</i>	<i>S. austinii</i>	<i>S. austinii</i>
<b>Cladonia portent %</b>	11-25	11-25	Absent	Absent
<b>Other Cladonia sp</b>	Absent	<i>C. uncialis</i>	Absent	
<b>C. panicea %</b>	Absent	1-3 (many indiv)	Absent	1-3 (many indiv)
<b>Calluna cover %</b>	na	26-33	4-10	51-75
<b>Calluna height(cm)</b>	31-40	21-30	0-10	21-30
<b>Other NotableSpecies</b>	<i>Erica tetralix</i>			<i>A. palustre</i> , <i>V. oxycoccus</i> , <i>E. nigrum</i>
<b>Other comment</b>		Q in a poor section of Sc3	wetter	Flush characteristics
<b>Date</b>	10/02/2005	06/10/2011	10/02/2005	05/10/2011

91D0 Bog woodland: Assessment sheet All Saints Bog

Site name	All Saints Bog	Recorders	DL, JC, JR, FFV, WC etc	Photo no.s	na
Stop Number	Qbw1	Date	05/10	Grid ref	201600/211112
Positive indicator species		✓	Negative indicator species		% Cover
Trees and woody species					
<i>Betula pubescens</i>		✓	Non-native conifer species		
<i>Pinus sylvestris</i>		✓	List:		
<i>Salix aurita</i>		✓			
Herbs & ferns			<i>Rhododendron ponticum</i>		
<i>Dryopteris</i> spp.		✓			
<i>Carex rostrata</i>		✓	<i>Pteridium aquilinum</i>		
<i>Juncus effusus</i>		✓	<i>Rubus</i> agg.		

<i>Molinia caerulea</i>	✓	Others List:	
<i>Vaccinium oxycoccos</i>	✓		
<i>Empetrum nigrum</i>	✓		
<i>Vaccinium myrtillus</i>	✓		
Mosses			
<i>Polytrichum commune</i>	✓		
<i>Sphagnum fimbriatum</i>	✓		
<i>Sphagnum fallax</i>	✓		
<i>Sphagnum palustre</i>	✓		
<i>Hylocomium splendens</i>	✓		
Pass = <i>Betula pubescens</i> , <i>Sphagnum</i> species plus ≥5 of the other species		Pass = Negative indicator species <10%	
Structural data	Result	Stop level	Passes
Median canopy height >4m	5	Green	>7
Total canopy cover >30% of plot	30	Amber	6-7
<i>Betula pubescens</i> >50% of canopy	100	Red	<6
Dwarf shrub layer cover 10-50%	50		
<i>Calluna</i> cover <40%	20	Result	9
% <i>Sphagnum</i> cover (pass = ≥25%)	75		GREEN
% Bryophyte cover (pass = ≥50%)	90		

Target tree species dbh	Result	Old trees & dead wood (any species)	Result
<i>Betula pubescens</i>		No. of old/senescing trees >10cm	1
No. of stems 5-10 cm	17	No. of standing dead trees >10cm	4
No. of stems 10-20 cm	5	No. of fallen dead trees >10cm	2

No. of stems >20 cm <i>Pinus sylvestris</i> No. of stems 5-10 cm No. of stems 10-20 cm No. of stems >20 cm		Potential indicator No. dead stems	?
Pass = Over all stops each size class represents at least 15% of total stems		Pass = 1+ old/senescing trees (or dead branches) in >25% of stops and 4+ standing dead or fallen dead	
<i>Betula pubescens</i> regeneration		Native tree regeneration (incl. Pinus)	
Pass = >1 sapling >1m in each plot	16	Pass = >1 sapling >1m in ≥50% of plots	1

Site name	All Saints Bog	Recorders	DL, JC, JR, FFV, WC etc	Photo no.s	102-0490
Stop Number	Qbw2	Date	05/10	Grid ref	201529/211198
Positive indicator species	✓	Negative indicator species	% Cover		
Trees and woody species					
<i>Betula pubescens</i>	✓	Non-native conifer species			
<i>Pinus sylvestris</i>		List:			
<i>Salix aurita</i>	✓				
Herbs & ferns		<i>Rhododendron ponticum</i>			
<i>Dryopteris spp.</i>	✓				
<i>Carex rostrata</i>	✓	<i>Pteridium aquilinum</i>	15		
<i>Juncus effusus</i>	✓	<i>Rubus agg.</i>	1		
<i>Molinia caerulea</i>					
<i>Vaccinium oxycoccos</i>	✓	Others			
<i>Empetrum nigrum</i>	✓	List:			
<i>Vaccinium myrtillus</i>	✓				

Mosses			
<i>Polytrichum commune</i>	✓		
<i>Sphagnum fimbriatum</i>	✓		
<i>Sphagnum fallax</i>	✓		
<i>Sphagnum palustre</i>	✓		
<i>Hylocomium splendens</i>	✓		
Pass = <i>Betula pubescens</i> , <i>Sphagnum</i> species plus ≥5 of the other species		Pass = Negative indicator species <10%	
Structural data	Result	Stop level	Passes
Median canopy height >4m	7	Green	>7
Total canopy cover >30% of plot	40	Amber	6-7
<i>Betula pubescens</i> >50% of canopy	100	Red	<6
Dwarf shrub layer cover 10-50%	40		
<i>Calluna</i> cover <40%	5	Result	8
% <i>Sphagnum</i> cover (pass = ≥25%)	75		GREEN
% Bryophyte cover (pass = ≥50%)	90		

Target tree species dbh	Result	Old trees & dead wood (any species)	Result
<i>Betula pubescens</i>		No. of old/senescing trees >10cm	
No. of stems 5-10 cm	12	No. of standing dead trees >10cm	
No. of stems 10-20 cm	9	No. of fallen dead trees >10cm	2
No. of stems >20 cm	2		
<i>Pinus sylvestris</i>		Potential indicator	
No. of stems 5-10 cm		No. dead stems	8
No. of stems 10-20 cm			
No. of stems >20 cm			
Pass = Over all stops each size class represents at least 15% of total stems		Pass = 1+ old/senescing trees (or dead branches) in >25% of stops and 4+ standing dead or fallen	



		dead	
<i>Betula pubescens</i> regeneration		Native tree regeneration (incl. Pinus)	
Pass = >1 sapling >1m in each plot	40	Pass = >1 sapling >1m in ≥50% of plots	3

Site name	All Saints Bog	Recorders	DL, JC, JR, FFV, WC etc	Photo no.s	102-0493
Stop Number	Qbw3	Date	05/10	Grid ref	201329/211145
Positive indicator species		✓	Negative indicator species		% Cover
Trees and woody species					
<i>Betula pubescens</i>		✓	Non-native conifer species		
<i>Pinus sylvestris</i>			List:		
<i>Salix aurita</i>		✓			
Herbs & ferns			<i>Rhododendron ponticum</i>		
<i>Dryopteris</i> spp.		✓			
<i>Carex rostrata</i>		✓	<i>Pteridium aquilinum</i>		15
<i>Juncus effusus</i>			<i>Rubus</i> agg.		
<i>Molinia caerulea</i>					
<i>Vaccinium oxycoccos</i>		✓	Others		
<i>Empetrum nigrum</i>		✓	List:		
<i>Vaccinium myrtillus</i>		✓			
Mosses					
<i>Polytrichum commune</i>		✓			
<i>Sphagnum fimbriatum</i>		✓			
<i>Sphagnum fallax</i>		✓			
<i>Sphagnum palustre</i>		✓			
<i>Hylocomium splendens</i>		✓			

Pass = <i>Betula pubescens</i> , <i>Sphagnum</i> species plus $\geq 5$ of the other species		Pass = Negative indicator species <10%	
Structural data	Result	Stop level	Passes
Median canopy height >4m	8	Green	>7
Total canopy cover >30% of plot	60	Amber	6-7
<i>Betula pubescens</i> >50% of canopy	90	Red	<6
Dwarf shrub layer cover 10-50%	40		
<i>Calluna</i> cover <40%	5	Result	8
% <i>Sphagnum</i> cover (pass = $\geq 25\%$ )	40		GREEN
% Bryophyte cover (pass = $\geq 50\%$ )	90		

Target tree species dbh	Result	Old trees & dead wood (any species)	Result
<i>Betula pubescens</i>		No. of old/senescing trees >10cm	
No. of stems 5-10 cm	2	No. of standing dead trees >10cm	2
No. of stems 10-20 cm	16	No. of fallen dead trees >10cm	1
No. of stems >20 cm	4		
<i>Pinus sylvestris</i>		Potential indicator	
No. of stems 5-10 cm		No. dead stems	2
No. of stems 10-20 cm			
No. of stems >20 cm			
Pass = Over all stops each size class represents at least 15% of total stems		Pass = 1+ old/senescing trees (or dead branches) in >25% of stops and 4+ standing dead or fallen dead	
<i>Betula pubescens</i> regeneration		Native tree regeneration (incl. <i>Pinus</i> )	
Pass = >1 sapling >1m in each plot	32	Pass = >1 sapling >1m in $\geq 50\%$ of plots	20

Site name	All Saints Bog	Recorders	DL, JC, JR, FFV, WC etc	Photo no.s	102-0496
Stop Number	Qbw4	Date	05/10	Grid ref	201068/211257
Positive indicator species		✓	Negative indicator species		% Cover
Trees and woody species			Non-native conifer species		
<i>Betula pubescens</i>		✓	List:		
<i>Pinus sylvestris</i>					
<i>Salix aurita</i>		✓			
Herbs & ferns			<i>Rhododendron ponticum</i>		
<i>Dryopteris spp.</i>		✓			
<i>Carex rostrata</i>		✓	<i>Pteridium aquilinum</i>		
<i>Juncus effusus</i>		✓	<i>Rubus agg.</i>		
<i>Molinia caerulea</i>		✓			
<i>Vaccinium oxycoccos</i>		✓	Others		
<i>Empetrum nigrum</i>		✓	List:		
<i>Vaccinium myrtillus</i>		✓			
Mosses					
<i>Polytrichum commune</i>		✓			
<i>Sphagnum fimbriatum</i>		✓			
<i>Sphagnum fallax</i>		✓			
<i>Sphagnum palustre</i>		✓			
<i>Hylocomium splendens</i>		✓			
Pass = <i>Betula pubescens</i> , <i>Sphagnum</i> species plus ≥5 of the other species			Pass = Negative indicator species <10%		
Structural data		Result	Stop level		Passes
Median canopy height >4m		6	Green		>7
Total canopy cover >30% of plot		40	Amber		6-7

<i>Betula pubescens</i> >50% of canopy	100	Red	<6
Dwarf shrub layer cover 10-50%	40		
<i>Calluna</i> cover <40%	20	Result	9
% <i>Sphagnum</i> cover (pass = $\geq 25\%$ )	40		GREEN
% Bryophyte cover (pass = $\geq 50\%$ )	90		

Target tree species dbh	Result	Old trees & dead wood (any species)	Result
<i>Betula pubescens</i>		No. of old/senescing trees >10cm	
No. of stems 5-10 cm	11		1
No. of stems 10-20 cm	14	No. of standing dead trees >10cm	2
No. of stems >20 cm	1	No. of fallen dead trees >10cm	
<i>Pinus sylvestris</i>			
No. of stems 5-10 cm		Potential indicator	6
No. of stems 10-20 cm		No. dead stems	
No. of stems >20 cm			
Pass = Over all stops each size class represents at least 15% of total stems		Pass = 1+ old/senescing trees (or dead branches) in >25% of stops and 4+ standing dead or fallen dead	
<i>Betula pubescens</i> regeneration		Native tree regeneration (incl. <i>Pinus</i> )	
Pass = >1 sapling >1m in each plot	35	Pass = >1 sapling >1m in $\geq 50\%$ of plots	5

Assessment methodology

Assessment	Stop level	4-stop level
Green	4 stops pass	3-4 passes
Amber	4 stops pass	2 passes
Amber	3 stops pass	3-4 passes
Red	4 stops pass	1 pass
Red	3 stops pass	1 pass
Red	<3 stops pass	Any result

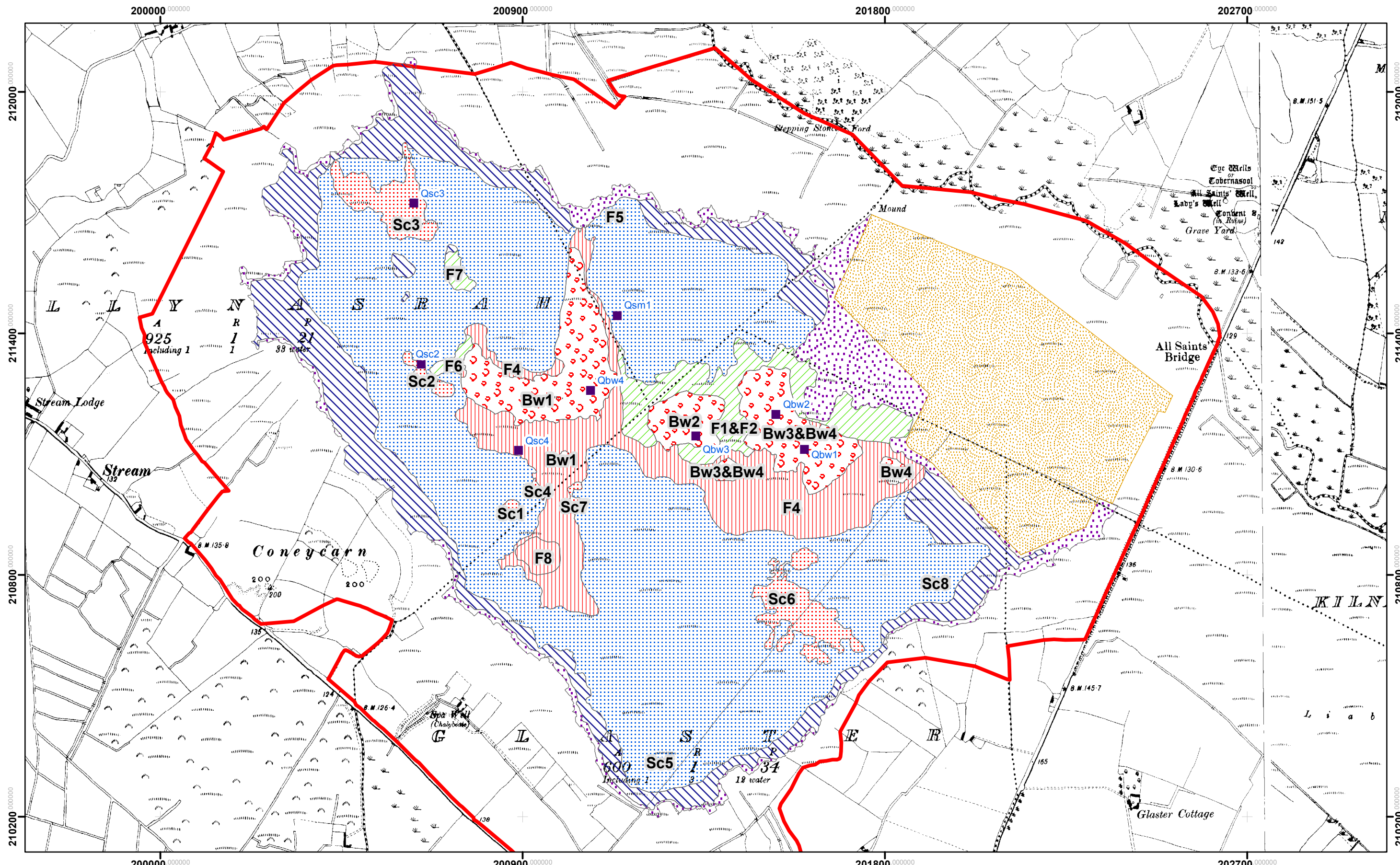
Result

Stop level - 4 stops pass

4-stop level - 4 passes

Assessment GREEN (Favourable)

## **Appendix IV Survey maps**



### Raised Bog Monitoring Survey 2011

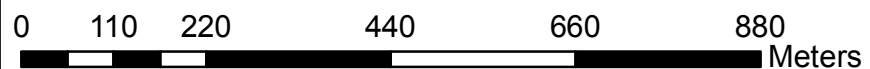
#### Map 1: Ecotopes Map and Quadrats

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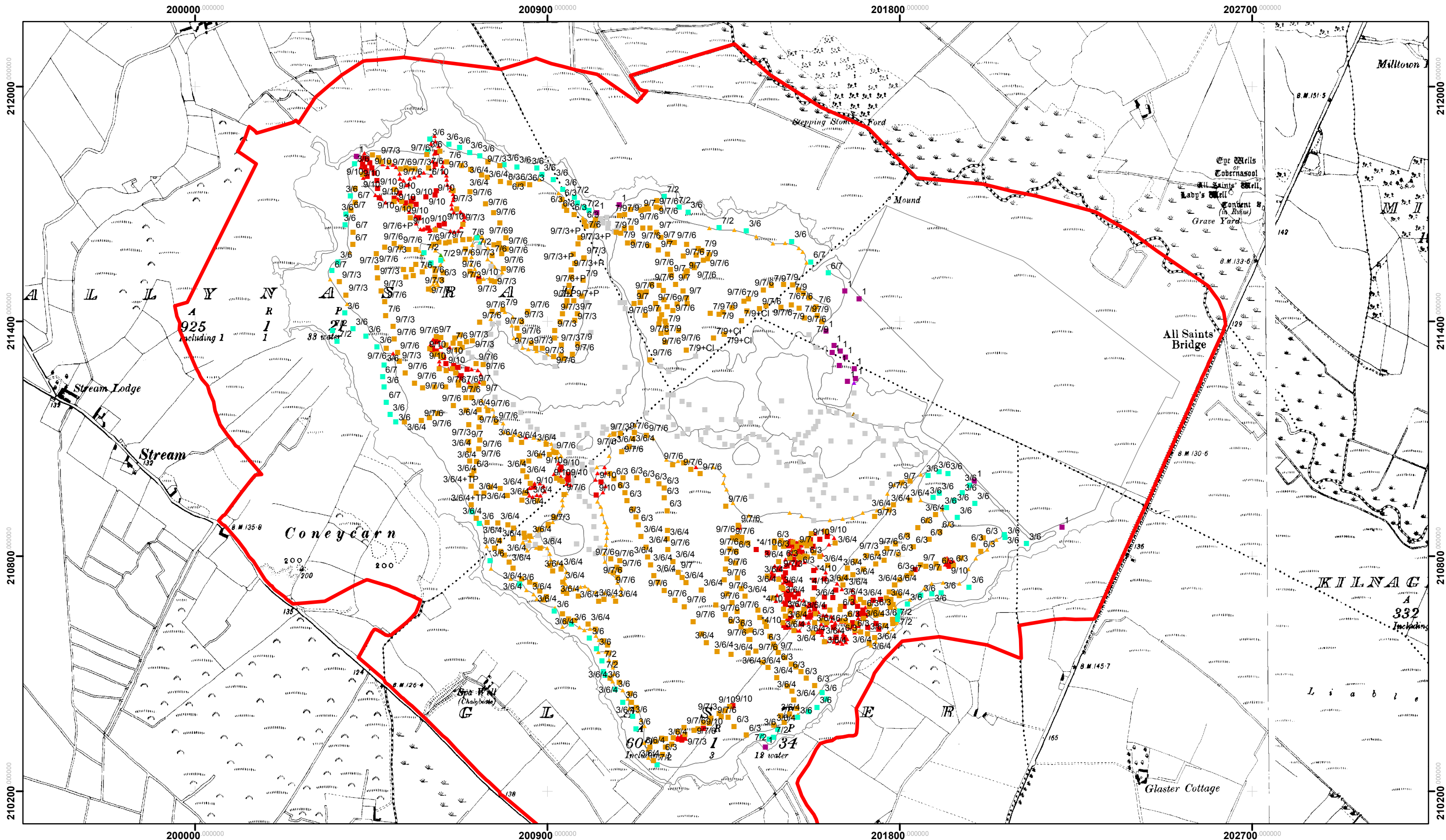
### All Saint's Bog SAC (000566) Co. Offaly

1:9,000



### Legend

■ Quadrat	Woodland	Marginal
<b>Ecotope type</b>	Active Flush	Face bank
■ Central	Open water	Bare Peat
■ Sub-central	Sub-marginal	■ SAC
■ Bog Woodland	Inactive Flush	



**Raised Bog Monitoring Survey 2011**

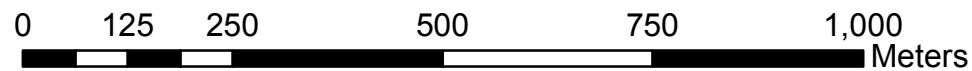
**Map 2: Vegetation community complexes**

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**All Saint's Bog SAC (000566)  
Co. Offaly**

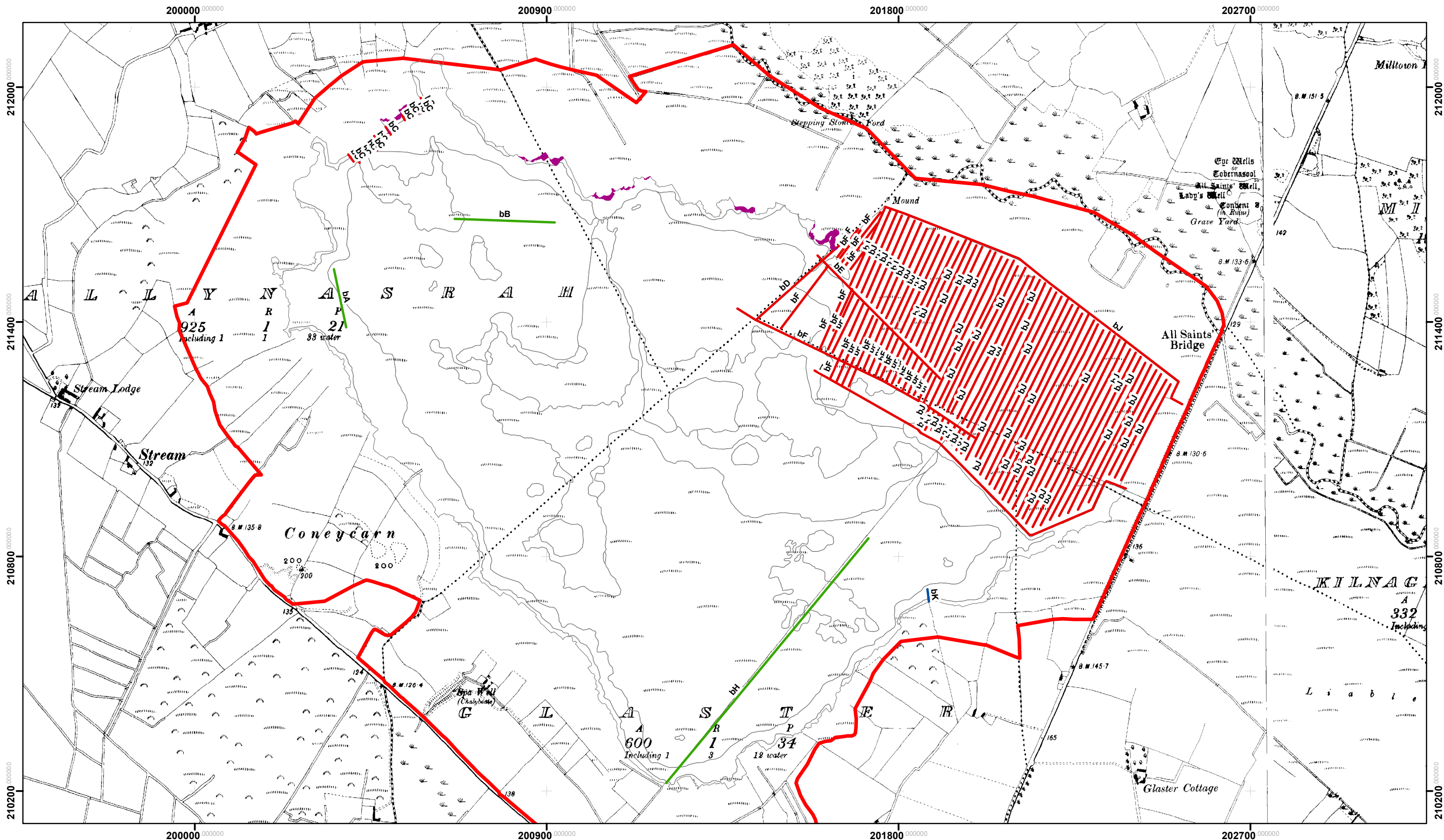
**1:9,000**



**Legend**

Ecotope type		Boundary type	
■	Central ecotope complex	■	Flush
■	Sub-central ecotope complex	▲	SC/C
■	Sub-marginal ecotope complex	▲	F/C
■	Marginal ecotope complex	▲	SM/C
■	Face bank ecotope complex	▲	M/C
▲	F/SC	▲	F/SM
▲	SM/SC	▲	M/SM
▲	M/SC	▲	Other
▲	FB/SC	▲	SAC
▲	F/M		
▲	M/FB		
▲	F/FB		





### Raised Bog Monitoring Survey 2011

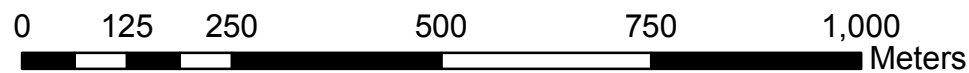
#### Map 3: Impacts (High Bog drainage; Turf cutting; Fire events)

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### All Saint's Bog SAC (000566) Co. Offaly

1:9,000



#### Legend

- High bog cut away 2005-2011
- Not blocked:functional
- Not blocked:non-functional
- Blocked:non-functional
- Blocked:reduced functional
- SAC
- Ecotopes