Mweelrea/Sheeffry/Erriff Complex SAC

(site code 001932)

Conservation objectives supporting document

- blanket bogs and associated habitats

NPWS

Version 1

July 2017

Contents

List of Maps

1 Introduction

Achieving Favourable Conservation Status (FCS) is the overall objective to be reached for all Annex I habitat types and Annex II species of European Community interest listed in the EU Habitats Directive 92/43/EEC. It is defined in positive terms such that a habitat type or species must be prospering and have good prospects of continuing to do so.

Almost 19% of Ireland can be considered to support upland habitats (Perrin *et al*., 2009). The importance of these areas for biodiversity conservation is unquestionable, with numerous upland habitat types listed under Annex I of the EU Habitats Directive and many rare and threatened bird and other animal species being associated with these habitats. This is reflected in the fact that over 40% of the total terrestrial area currently selected for designation as Special Areas of Conservation (SAC) in Ireland lies above 150m in altitude.

The Scoping Study and Pilot Survey of Upland Habitats (Perrin *et al*., 2009) was commissioned by the National Parks and Wildlife Service (NPWS) with the primary remit of devising an appropriate strategy and methodologies for conducting a National Survey of Upland Habitats (NSUH). Four phases of the NSUH have since been completed between 2010 and 2014. The principle aims of the NSUH are to map all habitats within a site and to assess the conservation condition of the relevant Annex I habitats, listed in Table 1 below.

Mweelrea/Sheeffry/Erriff Complex SAC was surveyed as part of Phase 1 of the NSUH between August and October 2010. An area centred on the high peaks of the Mweelrea Mountains had already been surveyed as part of the Pilot Phase of the NSUH between April and July 2009. The results of the surveys are reported in Roche *et al*. (2014).

Table 1: Annex I habitats that occur in Irish uplands and which are primary focus habitats for the NSUH. Habitats in bold are those that are listed as Qualifying Interests for Mweelrea/Sheeffry/Erriff Complex SAC.

Habitat code	Habitat name
4010	**Northern Atlantic wet heaths with *Erica tetralix***
4030	**European dry heaths**
4060	**Alpine and Boreal heaths**
6230	Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) *
7130	**Blanket bogs (* if active bog)**
7140	**Transition mires and quaking bogs**
7150	**Depressions on peat substrates of the Rhynchosporion**
7230	**Alkaline fens**
8110	**Siliceous screes of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani)**
8120	Calcareous and calcshist screes of the montane to alpine levels (Thlaspietea rotundifolii)
8210	**Calcareous rocky slopes with chasmophytic vegetation**
8220	**Siliceous rocky slopes with chasmophytic vegetation**

* Denotes a priority habitat under the EU Habitats Directive

1.1 Mweelrea/Sheeffry/Erriff Complex SAC

Mweelrea/Sheeffry/Erriff Complex SAC in Co. Mayo is a very large SAC, being 20,983ha in extent and stretching from the fjord of Killary Harbour in the south-west across to the edge of the Partry Mountains in the east (refer to O.S. Discovery Series maps 37 and 38). The SAC has been designated for a large number of upland Annex I habitats as well as several coastal habitat types that occur in the west of the SAC. The SAC chiefly comprises the Sheeffry Hills (762m in altitude), Ben Gorm (700m), the Mweelrea Mountains (814m), the area of the Partry Mountains around Lough Glenawough, and a large area of lowland blanket bog in the valley of the Erriff River.

1.2 NSUH mapping methodology

A detailed habitat mapping survey of Mweelrea/Sheeffry/Erriff Complex SAC utilising the NSUH methodology presented in Perrin *et al*. (2014) has been conducted. A brief description of the methodology used to map habitats by the NSUH is presented here to elucidate how area was calculated for each of the habitats and to explain how the gradated distribution maps were produced. For full details, see Perrin *et al.* (2014).

The local topography of most upland areas consists of intricate patterns of hollows, rocky outcrops, flushes and terraces. The mosaics of vegetation that have developed on this varying topography is often far too complex to map as individual habitats in the manner possible for more uniform landscapes. Hence, the approach adopted by the NSUH was to map units (referred to as polygons) that reflect homogeneous mosaics of vegetation and topography. Attempting to map smaller polygons representing single habitats would have greatly increased the amount of time spent mapping and the number of polygons mapped, and would not ultimately have eliminated the need for recording mosaics at smaller scales. All the habitats and non-vegetated substrates present in each polygon and the approximate percentage of the polygon they occupy were recorded. As the total area of each polygon is known from digitisation, data on the approximate extent of each habitat can be readily calculated. A provisional vegetation classification of upland vegetation types was developed to allow more detailed recording of plant communities than would be possible using a habitat classification scheme such as Fossitt (2000).

It is important to note that the NSUH classified and assessed habitats according to the flora and vegetation communities currently present rather than that which may previously have occurred. For example, on an area of drained deep wet blanket peat, the current plant communities may be more akin to wet heath than blanket bog as species sensitive to desiccation may have disappeared after drainage. Such an area would therefore have been mapped as wet heath (current vegetation) rather than drained blanket bog. As a result of this approach, the only vegetation classified and mapped as the inactive component of 7130 Blanket bogs (* if active) was *Eriophorum angustifolium* – *Sphagnum fallax* swards on eroded bog where a reasonable depth of peat remains. The Fossitt (2000) habitat PB4 Bare peat was used for recently cutover areas of peat. Where older cutover areas had revegetated to another vegetation community, or supported a non-vegetation cover type, they were recorded under the relevant vegetation community.

Note that the NSUH used the most up to date SAC boundary dataset available at the time of survey. For Mweelrea/Sheeffry/Erriff Complex SAC, this was the boundary available in September 2010, which was based on the Ordnance Survey six-inch map base. Any areas calculated and presented here are based on this boundary version.

1.3 Potential for habitat restoration

Restoration management for 7130 Blanket bogs (* if active bog) in this SAC is required, as the conservation objective for the habitat is to restore favourable conservation condition here. Areas that might be restored to active blanket bog could include inactive bog, bare eroding bog and recent cutover bog, and also areas of drained deep peat or older cutovers which currently support other types of vegetation such as heath. These latter areas may be classified as other Annex I habitats (e.g. 4010). Restoration of priority 7130 habitat may therefore result in loss in the area and distribution of other Annex I habitats that are Qualifying Interests. If such scenarios are identified by restoration management plans, the conservation objectives for these other Qualifying Interests should be adjusted accordingly.

There are significant areas of non-Annex I upland grassland habitats within Mweelrea/Sheeffry/Erriff Complex SAC (Roche *et al*., 2014). These areas occur throughout the SAC, but are particularly concentrated on the slopes of the Sheeffry Hills, the Mweelrea Mountains, Ben Gorm and Ben Creggan and the northern side of Tangincartoor. The majority of the grasslands have probably been formed by long-term degradation of either 4030 Dry heaths or 4010 Wet heaths due to overgrazing and/or burning. Therefore, within this expanse there are potential areas for restoration of these Annex I habitats.

2 Conservation objectives

A site-specific conservation objective aims to define the favourable conservation condition of a habitat or species at site level. The maintenance of habitats and species within sites at favourable condition will contribute to the maintenance of favourable conservation status (FCS) of those habitats and species at a national level.

Conservation objectives are defined using attributes and targets that are based on parameters as set out in the Habitats Directive for defining favourable status, namely area, range, and structure and functions.

The *Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland* (Perrin *et al*., 2014) have been used as a basis for setting most of the site-specific attributes and targets for uplands habitats. However, attributes and targets may change/become more refined as further information becomes available.

Objectives for habitats have been set with reference to the assessment of those habitats in Roche *et al*. (2014). If area and structure and functions were both assessed as “Favourable”, the objective for that habitat is to maintain favourable conservation condition. If either parameter was assessed as “Unfavourable – Inadequate” or “Unfavourable – Bad”, the objective for that habitat is to restore favourable conservation condition.

This document provides supporting information for the attributes of the conservation objectives for blanket bogs and associated habitats within Mweelrea/Sheeffry/Erriff Complex SAC, given in the main conservation objectives document for the SAC. The two documents should be read in conjunction with each other.

The conservation objective for each of the Annex I habitats dealt with in this supporting document are as follows:

- To restore the favourable conservation condition of Northern Atlantic wet heaths with *Erica tetralix* in Mweelrea/Sheeffry/Erriff Complex SAC.
- To restore the favourable conservation condition of European dry heaths in Mweelrea/ Sheeffry/Erriff Complex SAC.
- To restore the favourable conservation condition of Alpine and Boreal heaths in Mweelrea/ Sheeffry/Erriff Complex SAC.
- To restore the favourable conservation condition of Blanket bogs (* if active bog) in Mweelrea/Sheeffry/Erriff Complex SAC.
- To restore the favourable conservation condition of Transition mires and quaking bogs in Mweelrea/Sheeffry/Erriff Complex SAC.
- To restore the favourable conservation condition of Depressions on peat substrates of the Rhynchosporion in Mweelrea/Sheeffry/Erriff Complex SAC.
- To restore the favourable conservation condition of Alkaline fens in Mweelrea/Sheeffry/ Erriff Complex SAC.
- To restore the favourable conservation condition of Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani) in Mweelrea/Sheeffry/Erriff Complex SAC.
- To maintain the favourable conservation condition of Calcareous rocky slopes with chasmophytic vegetation in Mweelrea/Sheeffry/Erriff Complex SAC.
- To restore the favourable conservation condition of Siliceous rocky slopes with chasmophytic vegetation in Mweelrea/Sheeffry/Erriff Complex SAC.

3 Area

Habitat extent is a basic attribute to be assessed when determining the condition of a particular habitat. The target is for the habitat area to be stable or increasing from the baseline which was established by Roche *et al.* (2014). These areas are reproduced in Table 2.

Table 2: Mapped extent of blanket bog and associated Annex I habitats that are listed as Qualifying Interests for Mweelrea/Sheeffry/Erriff Complex SAC. *denotes priority habitat.

Annex I code	Habitat	Area (ha)	% of SAC
4010	Wet heaths	4,861.9	23.17
4030	Dry heaths	359.8	1.72
4060	Alpine and Boreal heaths	147.8	0.71
7130*	Active blanket bogs	4,287.7	20.44
7130	Inactive blanket bogs	236.3	1.13
7140	Transition mires	96.2	0.46
7150	Rhynchosporion depressions	406.0	1.94
7230	Alkaline fens	44.8	0.21
8110	Siliceous screes	234.7	0.12
8210	Calcareous rocky slopes	1.7	0.01
8220	Siliceous rocky slopes	164.9	0.79

As mentioned earlier, the area of habitat 7130 comprises active and inactive blanket bogs. The most frequent example of the latter encountered in the NSUH is described in Perrin *et al*. (2014) as a monospecific sward of common cottongrass (*Eriophorum angustifolium*) on eroded bog where a reasonable depth of peat remains. Note, however, that where examples of this community occur on re-deposited, eroded peat, these areas will not have the structural, hydrological or functional characteristics of naturally formed blanket bog.

Loss of area since 1995 was investigated as part of the NSUH through a comparison of contemporary and past aerial photographs (Roche *et al*., 2014). Changes in areas that can be detected through this method are limited to obvious habitat changes such as mechanised turf-cutting, agricultural improvement, afforestation, the development of windfarms, roads or tracks, and large-scale discrete erosion events due to bog bursts or land slips. Where obvious anthropogenic losses have been identified, these are included in the area target.

In the case of 7130 Blanket bogs (* if active bog), it has not been practical to distinguish between habitat loss/deterioration due to chronic erosion that occurred prior to 1995 and that since 1995, or the causes of such erosion. Thus, the habitat area mapped, along with obvious losses, is likely to be an underestimate of the total area of 7130 Blanket bogs (* if active bog) present in 1995. See also the peat formation attribute under structure and functions.

4 Range

Each habitat's range at site level, in the form of habitat distribution, has been recorded through the mapping carried out through the NSUH and these are reproduced (see maps 1-10). The target is that there should be no decline from the current distribution.

5 Structure and functions

Structure and functions relates to the physical components of a habitat ("structure") and the ecological processes that drive it ("functions"). For blanket bogs and associated habitats, these include a range of aspects such as soil chemistry, vegetation composition, hydrological regime, community diversity, habitat quality, species occurrence, indicators of local distinctiveness, disturbed ground, evidence of burning and negative species occurrence. These structure and functions are expanded on in the sections below.

In Mweelrea/Sheeffry/Erriff Complex SAC, the structure and functions of 4010 Wet heaths were assessed as Unfavourable – Bad. Reasons for failure included inadequate cover of desirable species including dwarf shrubs, mosses and lichens, excessive grazing, excessive drainage and cover of disturbed bare ground.

The structure and functions of 4030 Dry heaths were assessed as Unfavourable – Bad. Reasons for failure included inadequate cover of desirable species and poor structural diversity of ling (*Calluna vulgaris*).

The structure and functions of 4060 Alpine and Boreal heaths were assessed as Unfavourable – Bad. Reasons for failure included inadequate cover of desirable species and the cover of negative indicator species.

The structure and functions of 7130 Blanket bogs (* if active bog) were assessed as Unfavourable – Bad. Reasons for failure included inadequate cover of mosses and lichens, excessive erosion, excessive drainage and cover of disturbed bare ground.

The structure and functions of 7140 Transition mires were assessed as Unfavourable – Inadequate, with one out of the four monitoring stops failing due to an inadequate number of desirable species.

The structure and functions of 7150 Rhynchosporion depressions were assessed as Unfavourable – Bad. Reasons for failure included the cover of disturbed bare ground and excessive drainage.

The structure and functions of 7230 Alkaline fens were assessed as Unfavourable – Bad. Reasons for failure included an inadequate cover of brown mosses and other desirable species.

The structure and functions of 8110 Siliceous scree were assessed as Unfavourable – Bad. Reasons for failure included an inadequate cover of mosses and lichens.

The structure and functions of 8210 Calcareous rocky slopes were assessed as Favourable.

The structure and functions of 8220 Siliceous rocky slopes were assessed as Unfavourable – Inadequate. The reason for failure was excessive cover of the non-native New Zealand willowherb (*Epilobium brunnescens*).

5.1 Ecosystem function

Ecosystem function is assessed primarily through consideration of soil nutrient levels for all habitats and also water quality for 7230 Alkaline fens. For 7130 Blanket bogs (* if active bog) and 7230 Alkaline fens, additional consideration is given to peat formation and hydrology.

5.1.1 Ecosystem function: soil nutrients

An attribute to assess the soil nutrients is common to each of the habitats with a view to maintain the soil nutrient status within the natural range suited to the habitat. Relevant nutrients and natural ranges have yet to be defined. Nitrogen deposition and associated acidification are noted as being relevant to blanket bogs and all associated habitats in NPWS (2013). The target for each habitat is to maintain the soil nutrients status within the natural range.

5.1.2 Ecosystem function: peat formation

Ecosystem function of 7130 Blanket bogs (* if active bog) and 7230 Alkaline fens is further assessed through peat formation. For 7130 Blanket bogs (*if active bog), Perrin *et al*. (2014) established an overriding assessment of blanket bog structure and functions based on the proportion of degraded bog within a site which includes eroding bog and cutover bog which would previously have been this Annex I habitat. If more than 1% of the combined area of active bog (Annex I habitat 7130*), inactive bog (Annex I habitat 7130), eroded bog (habitat category PB5 – Fossitt, 2000) and recently cutover bog (habitat PB4 – Fossitt, 2000) is inactive, eroded or cutover then it should be assessed as Unfavourable – Inadequate, even if the results of the monitoring stops data are more positive. If more than 5% of the combined area is inactive, eroded or cutover it is assessed as Unfavourable - Bad.

The EU habitats interpretation manual (European Commission, 2013) defines active blanket bog as "still supporting a significant area of vegetation that is normally peat-forming". For the purposes of defining favourable conservation condition of the Annex I habitat, the target is that at least 99% of the total Annex I blanket bog area is active bog.

For 7230 Alkaline fens, peat formation is dependent on water levels being slightly below or above the soil surface for *c*. 90% of the time. The target is to maintain active peat formation, where appropriate.

5.1.3 Ecosystem function: hydrology

Ecosystem function of 7130 Blanket bogs (* if active bog) and 7230 Alkaline fens is further assessed through assessment of hydrology. Regarding 7130 Blanket bogs (* if active bog), drains (cut for purposes of peat cutting, afforestation, etc.) and erosion gullies impact on the hydrology of blanket bog in the local vicinity. The target is for the natural hydrology to be unaffected by drains and erosion gullies. The process of restoring hydrological integrity may impact areas of heath habitats as discussed in Section 1.3. The target for 7230 Alkaline fens is to maintain the appropriate natural hydrological regimes necessary to support the natural structure and functioning of the habitat.

5.1.4 Ecosystem function: water quality

Ecosystem function of 7230 Alkaline fens is further assessed through assessment of water quality. The target is to maintain the appropriate water quality, particularly nutrient levels, to support the natural structure and functioning of the habitat.

5.2 Community diversity

Roche *et al*. (2014) recorded habitat information based on a provisional list of vegetation communities which is detailed in the NSUH manual (Perrin *et al*., 2014). Data is presented in the following tables on the abundance of the various communities that comprise blanket bog and the associated Qualifying Interest habitats in Mweelrea/Sheeffry/Erriff Complex SAC together with the area of each of these communities and the percentage of the SAC that these communities cover (hepatic mats associated with Qualifying Interests are considered under the indicators of local distinctiveness attribute).

The target for the SAC is to maintain the variety of vegetation communities within habitats 4010, 4030, 4060, 7130*, 7140 and 7230, subject to natural processes. Rhynchosporion depressions (7150) and the rocky Annex I habitats (8110, 8210 and 8220) are each defined by just one provisional vegetation community, therefore, the community diversity attribute does not apply to these habitats.

5.2.1 Community diversity data for 4010 Wet heaths

NSUH code	NSUH community	Area (ha)	% of SAC
WH1a	*Schoenus nigricans – Erica tetralix* wet heath continuous cover sub-community	1,127.4	5.37
WH1b	*Schoenus nigricans – Erica tetralix* wet heath open cover sub-community	647.6	3.09
WH2	*Trichophorum germanicum – Cladonia* spp. *– Racomitrium lanuginosum* wet heath	46.2	0.22
WH3	*Calluna vulgaris – Molinia caerulea – Sphagnum capillifolium* wet/damp heath	964	4.59
WH4a	*Trichophorum germanicum – Eriophorum angustifolium* wet heath typical sub-community	731.1	3.48
WH4b	*Trichophorum germanicum – Eriophorum angustifolium* wet heath *Calluna vulgaris* sub-community	333.3	1.59
WH4c	*Trichophorum germanicum – Eriophorum angustifolium* wet heath *Juncus squarrosus* sub-community	134.5	0.64
WH5	*Trichophorum germanicum – Nardus stricta – Racomitrium lanuginosum* montane wet heath	172.6	0.82
WH6	*Schoenus nigricans – Molinia caerulea – Myrica gale* wet heath	705	3.36
HM*	Hepatic mats	0.3	0.001
Total		4,861.9	23.17

* The NSUH assigned hepatic mats that occurred within wet heath to the Annex I habitat 4010 Wet heaths. However, for the purpose of the SSCO, Hepatic mats (HM) are considered under 'Indicators of local distinctiveness' rather than an addition to community diversity.

5.2.2 Community diversity data for 4030 Dry heaths

NSUH code	NSUH community	Area (ha)	% of SAC
DH1	*Ulex gallii – Erica cinerea* dry heath	0.01	0.00003
DH2	*Calluna vulgaris – Erica erigena – Molinia caerulea* dry heath	9.1	0.04
DH3	*Calluna vulgaris – Erica cinerea* dry heath	316.2	1.51
DH4	*Calluna vulgaris – Sphagnum capillifolium* dry/damp heath	17.1	0.08
DH5	*Calluna vulgaris – Antennaria dioica* dry heath	0.02	0.0001
DH6	*Calluna vulgaris – Vaccinium myrtillus* dry heath	12.7	0.06
HM*	Hepatic mats	4.8	0.02
Total		359.8	1.71

* The NSUH assigned hepatic mats that occurred within dry heath to the Annex I habitat 4030 Dry heaths. However, for the purpose of the SSCO, Hepatic mats (HM) are considered under 'Indicators of local distinctiveness' rather than an addition to community diversity.

5.2.3 Community diversity data for 4060 Alpine and Boreal heaths

NSUH code	NSUH community	Area (ha)	% of SAC
MH1a	*Calluna vulgaris – Racomitrium lanuginosum* montane heath typical sub-community	81	0.39
MH1b	*Calluna vulgaris – Racomitrium lanuginosum* montane heath *Juncus squarrosus* sub-community	26.2	0.13
MH2	*Vaccinium myrtillus – Racomitrium lanuginosum – Herbertus aduncus* montane heath	21.9	0.1
MH3	*Vaccinium myrtillus – Rhytidiadelphus loreus – Anthoxanthum odoratum* montane heath	3.9	0.02
MH4	*Calluna vulgaris – Juniperus communis* subsp. *nana* montane heath	14.5	0.07
HM*	Hepatic mats	0.3	0.001
Total		147.8	0.70

* The NSUH assigned hepatic mats that occurred within montane heath to the Annex I habitat 4060 Alpine and Boreal heaths. However, for the purpose of the SSCO, Hepatic mats (HM) are considered under 'Indicators of local distinctiveness' rather than an addition to community diversity.

5.2.4 Community diversity data for 7130 Blanket bogs

NSUH code	NSUH community	Area (ha)	% of SAC
BB1a	*Schoenus nigricans – Eriophorum angustifolium* bog continuous cover sub-community	1,663.4	7.93
BB1b	*Schoenus nigricans – Eriophorum angustifolium* bog open sub-community	649.2	3.09
BB2	*Schoenus nigricans – Sphagnum* spp. bog	421.3	2.01
BB3	*Eriophorum vaginatum – Sphagnum papillosum* bog	204.5	0.98
BB4	*Trichophorum germanicum – Eriophorum angustifolium* bog	1,168.5	5.57
BB5a	*Calluna vulgaris - Eriophorum* spp. bog typical sub-community	72.6	0.35
BB5b	*Calluna vulgaris - Eriophorum* spp. bog *Juncus squarrosus* sub-community	46.4	0.22
BB6a	*Eriophorum angustifolium – Juncus squarrosus* bog typical sub-community	23.2	0.11
BB6b	*Eriophorum angustifolium – Juncus squarrosus* bog arctic-alpine sub-community	0.02	0.0001
HW1i	*Sphagnum denticulatum/cuspidatum hollow* upland variant	4.7	0.02
HW1ii	*Sphagnum denticulatum/cuspidatum hollow* lowland variant	33.9	0.16
HW2*	*Eriophorum angustifolium – Sphagnum fallax* hollow	236.3	1.13
Total		4,524.0	21.6

* The NSUH community HW2 is assigned to 7130 Inactive blanket bog. For this reason, it is not considered a positive addition to community diversity.

5.2.5 Community diversity data for 7140 Transition mires

NSUH code	NSUH community	Area (ha)	% of SAC
PO1a	*Menyanthes trifoliata – Carex limosa* pool community infilling pool sub-community	66.9	0.32
PFLU5	*Carex rostrata – Sphagnum* spp. flush	21.7	0.1
RFEN1b	*Carex rostrata* fen species-poor sub-community	7.6	0.04
Total		96.2	0.46

5.2.6 Community diversity data for 7230 Alkaline fens

NSUH code	NSUH community	Area (ha)	% of SAC
RFLU1a	*Carex viridula oedocarpa – Pinguicula vulgaris – Juncus bulbosus* flush brown moss sub-community	14.1	0.07
RFLU2	*Eleocharis quinqueflora – Carex viridula* flush	0.1	0.001
RFLU4	*Schoenus nigricans – Scorpidium scorpioides* flush	30.6	0.15
Total		44.8	0.21

5.3 Vegetation composition

Vegetation composition is assessed through a range of attributes tailored to each of the habitats. In general terms, they establish minimum thresholds for the occurrence or cover of desirable species and maximum thresholds for undesirable species.

5.3.1 Vegetation composition: positive indicator species

The attribute for positive indicator species is common to each of the blanket bogs and associated Annex I habitats, and habitat-specific lists of the positive indicator species are presented in the NSUH manual (Perrin *et al*., 2014). A positive species criterion is set to ensure that vegetation remains representative of the habitat and is not degrading or succeeding to a different habitat. The target by which this attribute is measured varies between habitats. Descriptions of these habitats can be found in the NSUH manual (Perrin *et al*., 2014).

For some habitats, a certain number of positive indicator species is required. At least seven positive indicator species are required at each monitoring stop for 7130 Blanket bogs (* if active bog) and at least five are required for 7150 Rhynchosporion depressions. For 8210 Calcareous rocky slopes, at least three positive indicator species should occur at each monitoring stop and at least one fern or *Saxifraga* species from the positive indicator list is required. For 8220 Siliceous rocky slopes, at least one positive indicator in the vicinity of each monitoring stop is required. For 8110 Siliceous screes, the positive indicator attribute is only applied to block scree; examples of shaley, small structure screes are not assessed under this attribute. At least one positive indicator species is required. The positive indicator list is the same as for 8220 Siliceous rocky slopes.

7140 Transition mires require at least three positive indicator species for in-filling pools and flushes and at least six for fens, and also at least one core positive indicator species present at each monitoring stop. In addition, 25% total cover of positive indicator species is required.

7230 Alkaline fens require at least one brown moss positive indicator species at each monitoring stop, and at least two positive vascular plant indicator positive indicator species for small-sedge flushes and at least three for black bog-rush (*Schoenus nigricans*) flush and bottle sedge (*Carex rostrata*) fens. In addition, at least 20% total cover of positive indicator species (brown mosses and vascular plants) is required for small-sedge flushes and at least 75% cover is required for black bog-rush (*Schoenus nigricans*) flush and bottle sedge (*Carex rostrata*) fens.

For some other habitats, a percentage threshold is set. At least 50% cover of positive indicators is required for 4010 Wet heaths and at least 66% cover for 4060 Alpine and Boreal heaths.

4030 Dry heaths are assessed through the number of positive indicator species present and through the percentage cover of these. The positive indicator list is composed of dwarf shrub species. Only two species are required to meet the number of positive indicator species target as dry heaths are not necessarily rich in these species. However, vegetation supporting and possibly dominated by only one dwarf shrub species is not desirable. Low cover of dwarf shrubs would indicate that the habitat is transitional, usually to grassland. A maximum cover of dwarf shrubs is applied for calcareous heath, which was recorded in this SAC, due to the characteristically greater forb (broad-leaved herb) component.

5.3.2 Vegetation composition: other desirable species

Other elements of vegetation composition which can collectively be regarded as being desirable are also established with a range of habitat-specific targets set.

Lichens and bryophytes

Minimum thresholds for cover of lichens and bryophytes are set for habitats where a plentiful lichen/moss layer is characteristic, such as 4010 Wet heaths and 7130 Blanket bogs (* if active bog), and for 4030 Dry heaths, 4060 Alpine and Boreal heaths and 8110 Siliceous screes. The latter habitats are not necessarily rich in lichen and bryophyte species, but a minimum amount should still be present. Within the habitat-specific targets for these attributes, the specific species, or groups of species which are required, are listed together with any exclusions (e.g. *Sphagnum fallax* can be indicative of degraded bog so is excluded from the 7130 Blanket bogs (* if active bog) assessment and *Campylopus* and *Polytrichum* mosses are excluded from the 4030 Dry heaths assessment as they can be indicative of disturbed conditions).

Dwarf shrub cover

A minimum threshold cover for dwarf shrubs is set for 4060 Alpine and Boreal heaths. A relatively low threshold of at least 10% is set as loose rock and *Racomitrium lanuginosum* are characteristic elements and are often abundant. A lower cover of dwarf shrubs could indicate that the habitat is transitional to grassland or other montane vegetation. Note that minimum dwarf shrub cover within 4030 Dry heaths is addressed by the positive indicator species attribute.

Cross-leaved heath

Cross-leaved heath (*Erica tetralix*) is specifically mentioned in the formal title of habitat 4010 Wet heaths and is the only characteristic species listed in European Commission (2013). Whilst it is seldom abundant in wet heaths, its presence at high frequencies is considered one of the few characteristics common between the varied communities of this habitat (JNCC, 2009). The target is for the presence of cross-leaved heath within a 20m radius of each monitoring stop.

Ericoid species and crowberry

A dwarf shrub layer with ericoid species is characteristic of 4010 Wet heaths; crowberry (*Empetrum nigrum*) is only rarely present. Low cover of these species would be indicative of chronic overgrazing, burning, etc. The target is for at least 15% cover of these species at each monitoring stop.

***Rhynchospora* species**

A relatively plentiful cover of *Rhynchospora* species is characteristic of 7150 Rhynchosporion depressions. The target is for at least 10% cover of these species at each monitoring stop.

5.3.3 Vegetation composition: negative indicator species

A percentage cover threshold for negative indicator species has been established for all blanket bog and associated habitats listed as Qualifying Interests for Mweelrea/Sheeffry/Erriff Complex SAC, except 8210 and 8220. Habitat-specific negative indicator species lists have been established for each of the habitats (Perrin *et al*., 2014). Presence of these species would likely indicate undesirable impacts of management such as overgrazing, undergrazing, nutrient enrichment, agricultural improvement or impacts on hydrology. The percentage threshold is generally set quite low such that impacts can be reversed before they become more severe.

5.3.4 Vegetation composition: non-native species

An attribute for non-native species is common to each of the habitats. Non-native species can be invasive and have deleterious effects on native vegetation. The target for each habitat is for the total cover of non-native species to be less than 1%. A low target is set as non-native species can spread rapidly and are most easily dealt with when still at lower abundances.

5.3.5 Vegetation composition: undesirable native species

For many of the habitats, maximum percentage cover thresholds for undesirable native species are also set. These are detailed below.

Bracken, native trees and shrubs

The cover of bracken (*Pteridium aquilinum*) and native trees and shrubs is assessed for 4010 Wet heaths, 4030 Dry heaths and the rocky habitats (8110, 8210 and 8220). Tree and shrub cover is assessed for 7130 Blanket bogs (* if active bog), 7150 Rhynchosporion depressions and 7230 Alkaline fens. High cover of bracken would indicate that the habitat may be succeeding towards a dense bracken community, and high cover of native trees and shrubs would indicate that the habitat may be succeeding towards scrub or woodland due to lack of grazing or, for bog habitats, due to the habitat drying out. For chasmophytic rocky habitats (8210 and 8220), high cover of these species indicate that rocky slopes are becoming more vegetated which would impact on the niches of the chasmophytic species.

Grass and dwarf shrubs

For 8110 Siliceous screes, a high cover of grasses or dwarf shrubs would indicate that the scree is becoming less exposed and succeeding to another habitat. The target is for the total cover of grass species and dwarf shrubs to be less than 20%.

Soft rush and common reed

High cover of soft rush (*Juncus effusus*) in 4010 Wet heaths or 4030 Dry heaths would suggest undesirable hydrological conditions. Note, however, that poor flushes dominated by soft rush often naturally occur in mosaic with these habitats. Discrete areas of this separate habitat should not be considered here. The target is for the cover of soft rush to be less than 10%. For 7230 Alkaline fens, the cover of both soft rush and common reed (*Phragmites australis*) should collectively be less than 10%.

Potential dominant species

For 7130 Blanket bogs (* if active bog) and 7150 Rhynchosporion depressions, a maximum threshold is given for bog species which could potentially dominate the habitat, reflecting a reduction in diversity. The selected species for 7130 Blanket bogs (* if active bog) are ling (*Calluna vulgaris*), many-stalked spike-rush (*Eleocharis multicaulis*), hare's-tail cottongrass (*Eriophorum vaginatum*), purple moor-grass (*Molinia caerulea*), black bog-rush (*Schoenus nigricans*) and deergrass (*Trichoporum germanicum*). The target for 7130 Blanket bog (* if active bog) is for cover of each of the potential dominant species to be less than 75%. For 7150 Rhynchosporion depressions, the potentially dominant species are many-stalked spike-rush (*Eleocharis multicaulis*), purple moor-grass (*Molinia caerulea*), black bog-rush (*Schoenus nigricans*) and deergrass (*Trichophorum germanicum*). For 7150 Rhynchosporion depressions, the cover of each of the potential dominant species should be less than 35%.

Dwarf shrub cover

A dwarf shrub layer is characteristic of 4010 Wet heaths, but the vegetation should be a mixture of dwarf shrub and graminoid species, with higher cover of dwarf shrubs being potentially indicative of drainage. A maximum target of 75% is therefore set.

Similarly, the calcareous version of 4030 Dry heaths, which was recorded in this SAC, characteristically has a greater component of broad-leaved herbs than siliceous dry heaths. A maximum target of 75% is therefore set.

Dwarf shrub composition

The dwarf shrub layer within 4030 Dry heaths should not be composed primarily of bog-myrtle (*Myrica gale*), creeping willow (*Salix repens*) and western gorse (*Ulex gallii*). Bog-myrtle is indicative of flushed conditions and is more characteristic of wet heaths and blanket bogs. Creeping willow is more characteristic of dune heaths. Western gorse is a component of dry heaths, but high proportions of it may indicate a history of undesirable levels of grazing. The target for 4030 Dry heaths is for the proportion of dwarf shrub composed of these species to be collectively less than 50%.

5.4 Vegetation structure

Vegetation structure is assessed through a number of attributes tailored to each of the habitats. These measures assess levels of grazing and browsing, burning, *Sphagnum* condition and, for 4030 Dry heaths, growth phases of ling (*Calluna vulgaris*).

5.4.1 Browsing and grazing

Browsing is generally measured through viewing the last complete season's shoots of particular species and assessing the proportion which shows signs of having been browsed. The species which are assessed for browsing are generally the dwarf shrub species: ericoids, crowberry (*Empetrum nigrum*) and bog-myrtle (*Myrica gale*). The target for the heath habitats (4010, 4030 and 4060), 7130 Blanket bogs (* if active bog) and 7150 Rhynchosporion depressions is for less than 33% of shoots to show signs of browsing. On the rocky habitats (8110, 8210 and 8220), live leaves of forbs and shoots

of dwarf shrubs showing signs of grazing or browsing collectively should be less than 50%. An additional assessment of grazing of live leaves of specific graminoids is made for 4060 Alpine and Boreal heaths. The specific graminoids are stiff sedge (*Carex bigelowii*), wavy hair-grass (*Deschampsia flexuosa*), sheep's-fescue (*Festuca ovina*) and viviparous sheep's-fescue (*Festuca vivipara*). High levels of grazing of these species in 4060 Alpine and Boreal heaths would be undesirable as grazing is not required to maintain this habitat. The target for 4060 is that less than 10% of the live leaves of the specific graminoids collectively show signs of grazing. Grazing levels for 7140 Transition mires and 7230 Alkaline fens are assessed through vegetation height (see Section 5.4.4).

5.4.2 Burning

Fires can be part of the natural cycle of heaths and may, under carefully controlled circumstances, be used as an occasional management tool to promote regeneration of, or diversity of growth phases, in ling (*Calluna vulgaris*). However, currently most hill fires in Ireland are intentionally started to encourage grass growth for livestock. Fires that are too intense, too frequent, too extensive or which occur in sensitive areas are damaging to habitats. An assessment of burning is made for the heath habitats (4010, 4030 and 4060), 7130 Blanket bogs (* if active bog) and 7150 Rhynchosporion depressions. Habitat-specific lists of sensitive areas where burning should not occur are presented in Perrin *et al*. (2014).

4010 Wet heaths, 7130 Blanket bogs (* if active bog) and 7150 Rhynchosporion depressions have the same targets relating to there being no signs of burning into the moss, liverwort or lichen layer or exposure of peat surface due to burning and no signs of burning in sensitive areas. The target for 4030 Dry heaths is no sign of burning in sensitive areas. The target for 4060 Alpine and Boreal heaths, which does not require burning for the maintenance of the habitat, is for there to be no signs of burning within the habitat.

5.4.3 **Sphagnum** *condition*

Disturbance to *Sphagnum* is assessed for habitats 4010 Wet heaths, 7130 Blanket bogs (* if active bog) and 7150 Rhynchosporion depressions. High levels of disturbed *Sphagnum* would indicate undesirable levels of grazers. For each habitat, the target is for less than 10% of the *Sphagnum* cover to be crushed, broken and/or pulled up.

5.4.4 Vegetation height

Vegetation height is used as an indication of grazing intensity for 7140 Transition mires and 7230 Alkaline fens. For 7140 Transition mires and 7230 Alkaline fens, the proportion of live leaves and/or flowering shoots of vascular plants that are more than 15cm above the ground surface should be at least 50%. Vegetation heights lower than these would indicate undesirable levels of grazing.

5.4.5 Growth phases of ling

The growth phases of ling (*Calluna vulgaris*) are assessed for 4030 Dry heaths. The growth phases are pioneer (<10cm high), building (10-30cm high) and mature (>30cm high). The target is that all growth phases of ling should occur throughout the habitat, outside sensitive areas, with at least 10% of cover in the mature phase. As burning is undesirable within sensitive areas, it is not reasonable to

require the stated diversity of growth phases within these areas. The list of sensitive areas is presented in the NSUH manual (Perrin *et al*., 2014).

5.4.6 Senescent ling

The cover of senescent ling (*Calluna vulgaris*) in 4030 Dry heaths is also assessed. Senescence is part of the natural cycle of ling, but a dominance of ling in the senescent phase would indicate a lack of management (appropriate grazing or burning) to promote ling regeneration. The target is that the cover of senescent ling should be less than 50%.

5.5 Physical structure

The physical structure of the habitats can be damaged by drainage, walking trails, unsuitable levels of grazing and erosion. Physical structure is assessed through a number of attributes tailored to each of the habitats. Elements which are assessed for the various habitats comprise disturbed bare ground, drainage and erosion; these are detailed below.

5.5.1 Disturbed bare ground

This attribute is common to all the blanket bog and associated habitats listed as Qualifying Interests for Mweelrea/Sheeffry/Erriff Complex SAC, except the chasmophytic rocky habitats (8210 and 8220). Disturbance can include hoof marks, wallows, human foot prints, vehicle and machinery tracks and, for 8110 Siliceous screes, scree running. Excessive disturbance can result in loss of characteristic species and presage erosion for heaths and peatlands. Scree is subject to naturally recurrent disturbance, but high levels of disturbance may impact on vegetation cover and diversity. The target for each habitat is set at there being less than 10% disturbed ground.

5.5.2 Drainage

Drainage can result in loss of characteristic species and transition to drier habitats. This attribute is applied to 4010 Wet heaths, 7130 Blanket bogs (* if active bog), 7140 Transition mires, 7150 Rhynchosporion depressions and 7230 Alkaline fens. For each habitat, the target is the area showing signs of drainage from heavy trampling, tracking or ditches to be less than 10%.

5.5.3 Erosion

Erosion is assessed for 7130 Blanket bogs (* if active bog) and 7150 Rhynchosporion depressions. Erosion leads to loss of peat from the blanket bog system, increases in peat sediment in nearby water courses, loss of blanket bog habitat and drainage. The target for both habitats is that less than 5% of the greater bog mosaic comprises erosion gullies and eroded areas. The greater bog mosaic incorporates the blanket bog itself and associated vegetation types and non-vegetation cover types that appear to have been derived from former blanket bog, including, but not limited to, bare peat, loose rock, gravel and running water.

5.5.4 Tufa formations

For 7230 Alkaline fens, a further measure of disturbance in areas where tufa is present is assessed. The target is that the disturbed proportion of vegetation cover is less than 1%.

5.6 Indicators of local distinctiveness

Roche *et al.* (2014) compiled and mapped existing rare and notable plant records for the SAC and added any new records collected during the NSUH survey. Rare species (those considered at least *Near Threatened* on the appropriate Red Data List) which can be assigned to a particular habitat should be considered indicators of local distinctiveness for the habitat. The target is for no decline in distribution or population sizes of rare, threatened or scarce species associated with the particular habitat.

Where hepatic mats of the *Calluna vulgaris-Herbertus aduncus* community have been recorded within a particular habitat by Roche *et al*. (2014), these are also listed as indicators of local distinctiveness. No assessment of the conservation status of this community has been conducted but proposals for such an assessment are presented in Barron & Perrin (2014). The target for these hepatic mats is for no decline in status of hepatic mats associated with the habitat in question.

During the NSUH, the *Near Threatened* liverwort *Mastigophora woodsii* and the *Vulnerable* liverworts *Bazzania pearsonii* and *Scapania ornithopodioides* (Lockhart *et al*., 2012) were recorded within a hepatic mat on 4030 Dry heaths (Roche *et al*., 2014). These liverworts are listed on the Flora (Protection) Order, 2015 (FPO; Statutory Instrument No. 356 of 2015).

There is a historic record for the *Vulnerable* (Wyse Jackson *et al*., 2016) and FPO listed species small-white orchid (*Pseudorchis albida*) from the SAC, but this species cannot be attributed specifically to 4030 Dry heaths (Roche *et al*., 2014).

During the NSUH, *Mastigophora woodsii* and the *Near Threatened* moss *Grimmia donniana* (Lockhart *et al*., 2012) were recorded within 8110 Siliceous screes in the SAC by Roche *et al*. (2014).

Mastigophora woodsii and the *Near Threatened* moss *Sphagnum subsecundum* (Lockhart *et al*., 2012) can be attributed specifically to 4010 Wet heaths in the SAC (Roche *et al*., 2014).

During the NSUH, the *Near Threatened* and FPO listed species bog orchid (*Hammarbya paludosa*) (Wyse Jackson *et al*., 2016) and the *Near Threatened* moss *Sphagnum platyphyllum* (Lockhart *et al*., 2012) were recorded within 7230 Alkaline fens in the SAC by Roche *et al*. (2014).

The *Vulnerable* Alpine saw-wort (*Saussurea alpina*) (Wyse Jackson *et al*., 2016) has been recorded on the Sheeffry Hills in the Lough Brawn corrie (historic record) and the adjacent Lough Tarriff corrie (NSUH record), but this species cannot be attributed specifically to 8210 Calcareous rocky slopes (Roche *et al*., 2014).

6 References

Barron, S.J. & Perrin, P.M. (2014) National Survey of Upland Habitats (Phase 4, 2013-2014) – Summary report. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

European Commission (2013) Interpretation manual of European Union habitats EUR 28. European Commission, DG Environment.

Fossitt, J.A. (2000) A guide to habitats in Ireland. The Heritage Council, Kilkenny.

JNCC (2009) Common Standards Monitoring guidance for upland habitats. JNCC, Peterborough, UK.

Lockhart, N., Hodgetts, N. & Holyoak, D. (2012) Ireland Red List No. 8: Bryophytes. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

NPWS (2013) The status of EU protected habitats and species in Ireland. Vol. 2. Habitat assessments. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

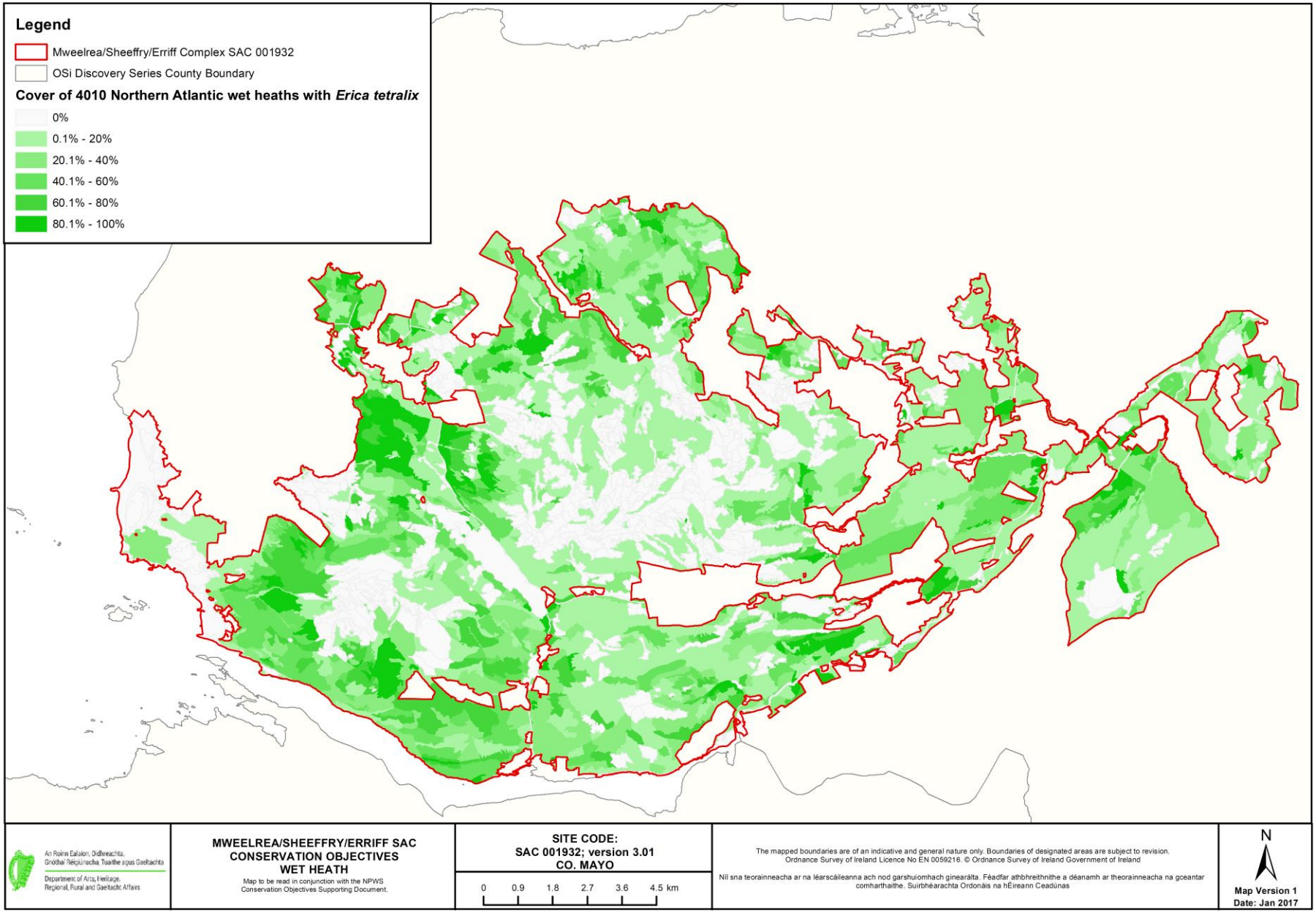
Perrin, P.M., O'Hanrahan, B., Roche, J.R. & Barron, S.J. (2009) Scoping Study and Pilot Survey for a National Survey and Conservation Assessment of Upland Vegetation and Habitats in Ireland. Unpublished report to National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin.

Perrin, P.M., Barron, S.J., Roche, J.R. & O'Hanrahan, B. (2014) Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland. Version 2.0. Irish Wildlife Manuals, No. 79. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

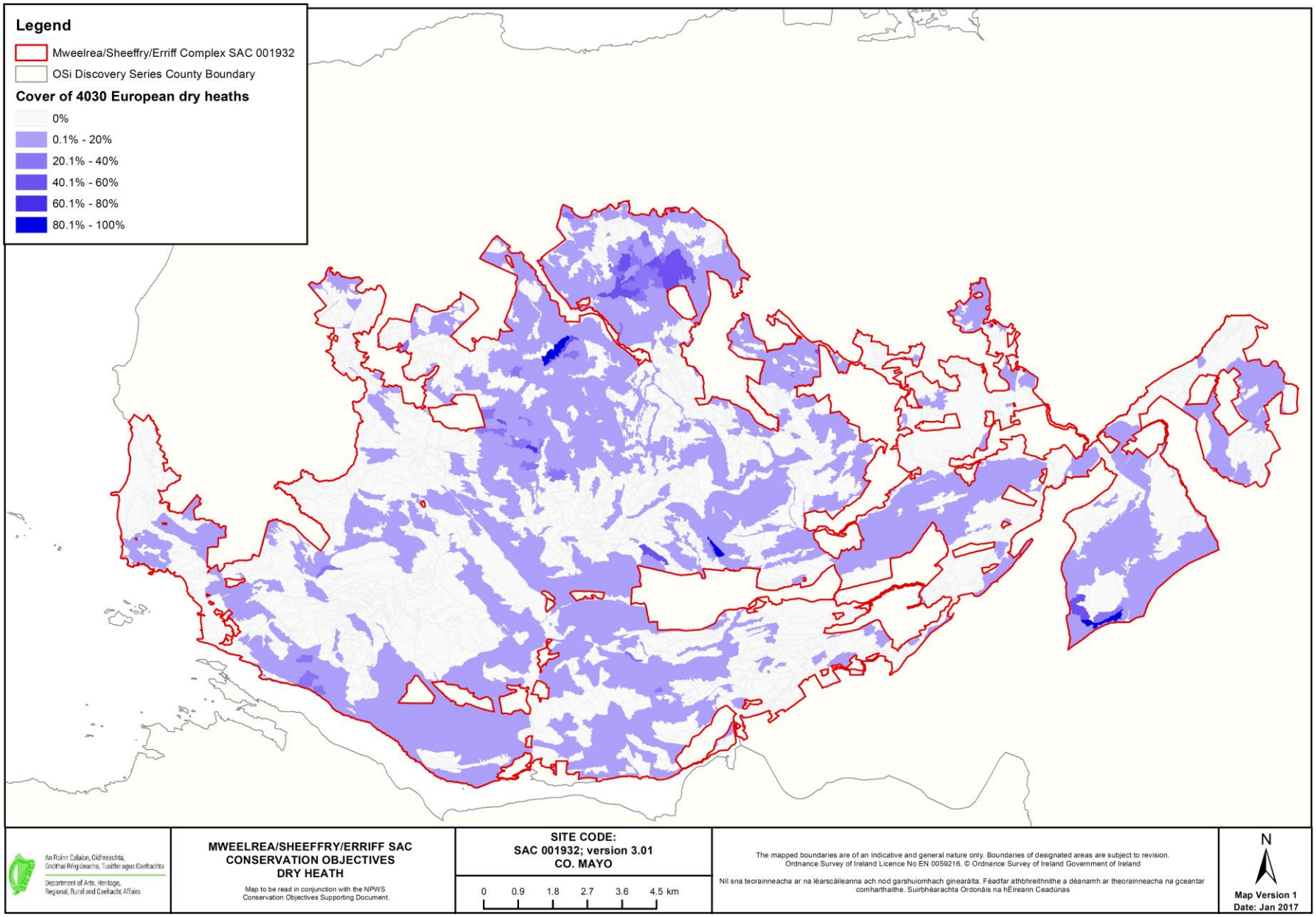
Roche, J.R., Perrin, P.M., Barron, S.J. & Daly, O.H. (2014) National Survey of Upland Habitats (Phase 1, 2010 - 2011) Site Report No 1: Mweelrea/Sheeffry/Erriff Complex cSAC (001932) Co. Mayo (Revision). National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.

Wyse Jackson, M., FitzPatrick, Ú., Cole, E., Jebb, M., McFerran, D., Sheehy Skeffington, M. & Wright, M. (2016) Ireland Red List No. 10: Vascular Plants. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs, Dublin, Ireland.

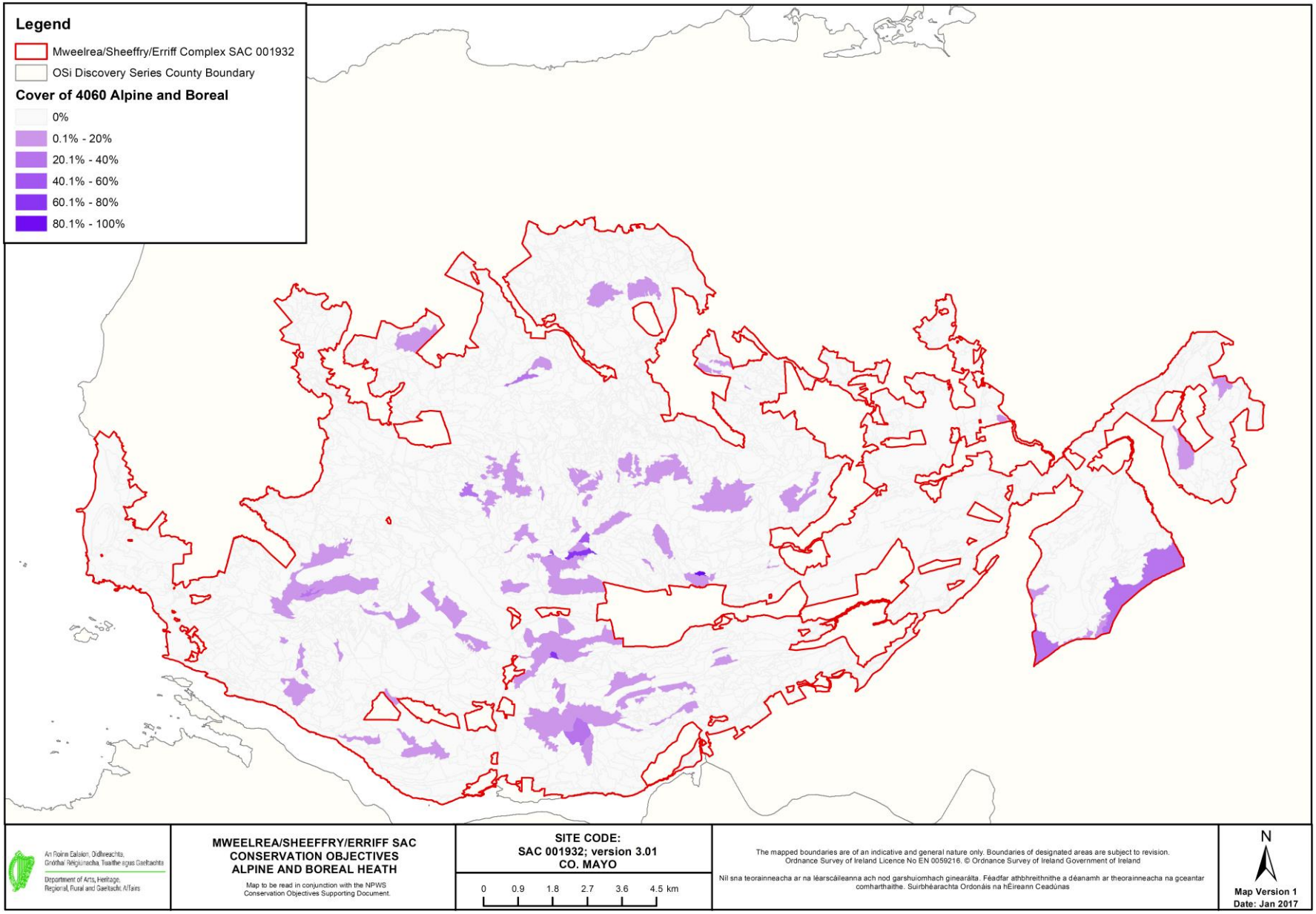
Map 1 Mweelrea/Sheeffry/Erriff Complex SAC Conservation Objectives – 4010 Wet heaths



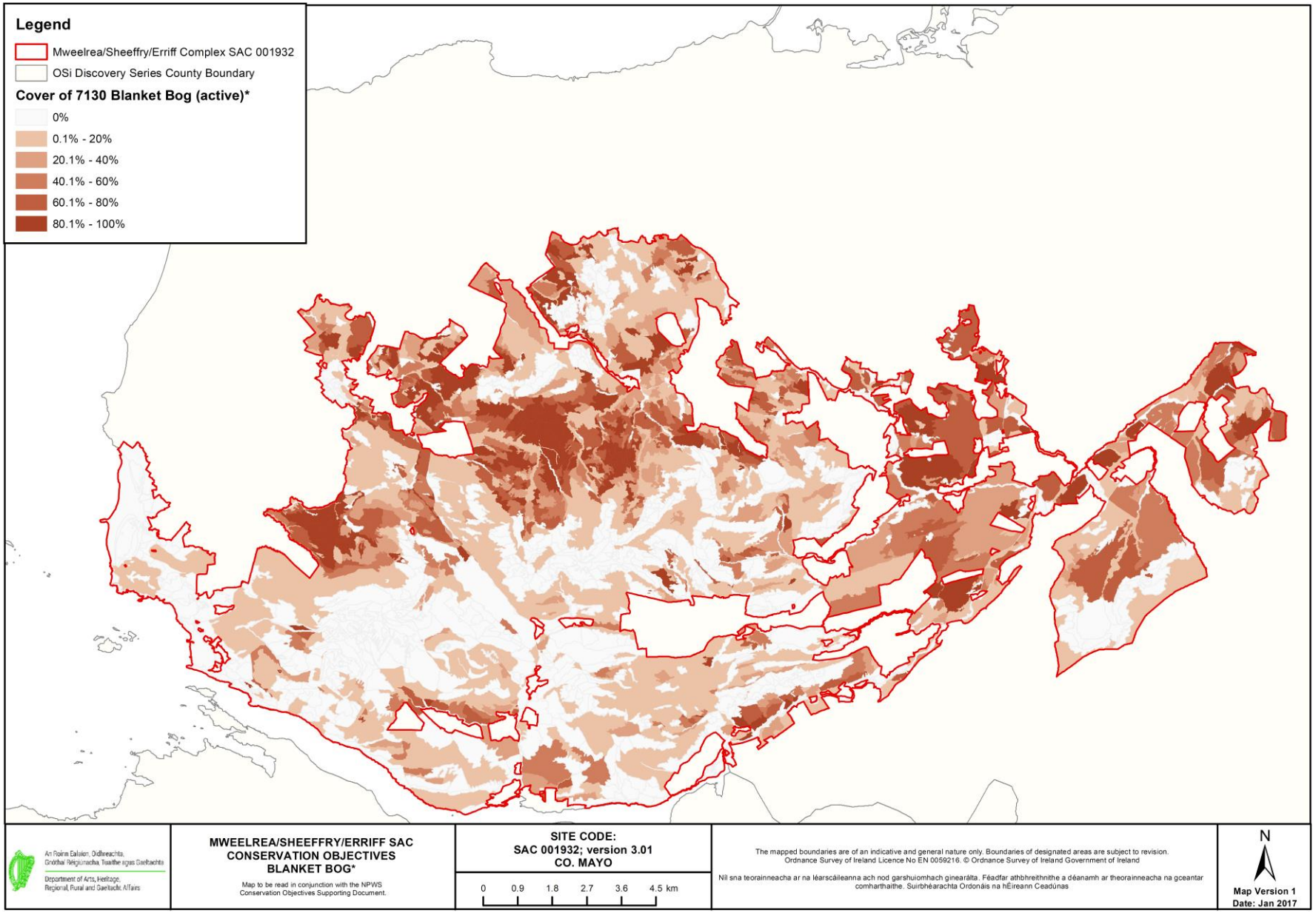
Map 2 Mweelrea/Sheeffry/Erriff Complex SAC Conservation Objectives – 4030 Dry heaths



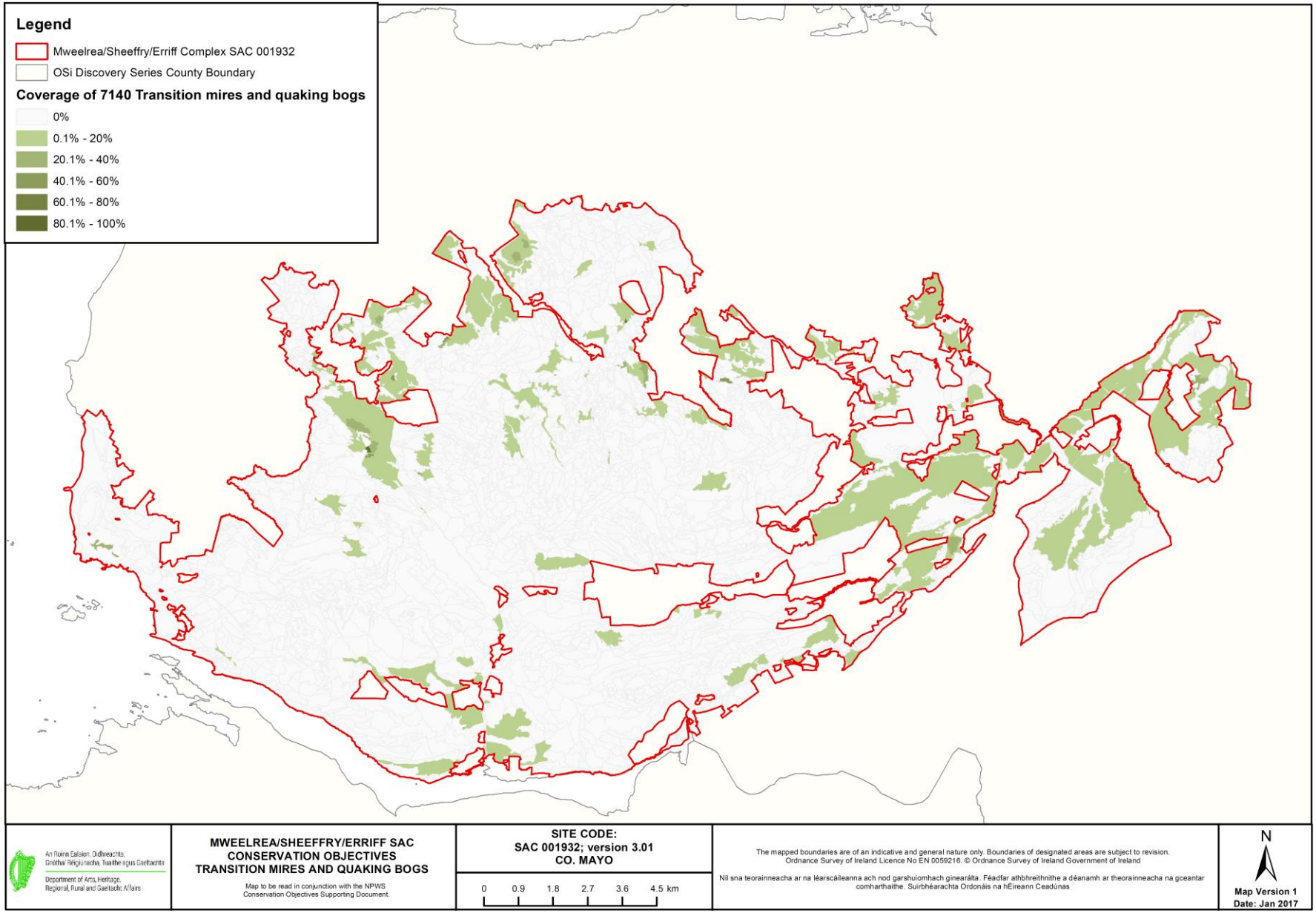
Map 3 Mweelrea/Sheeffry/Erriff Complex SAC Conservation Objectives – 4060 Alpine and Boreal heaths



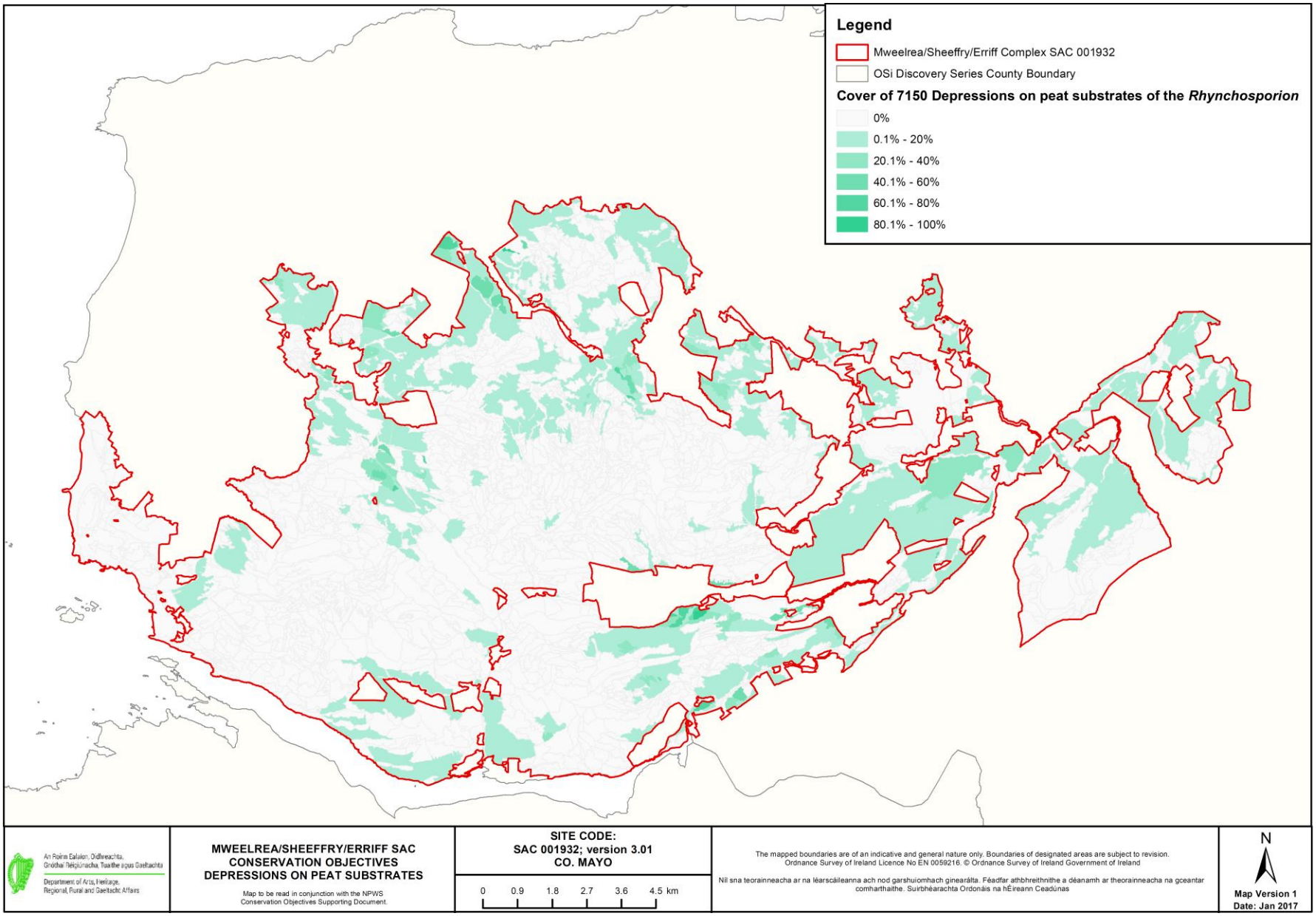
Map 4 Mweelrea/Sheeffry/Erriff Complex SAC Conservation Objectives – 7130 Blanket bogs (* if active bog)



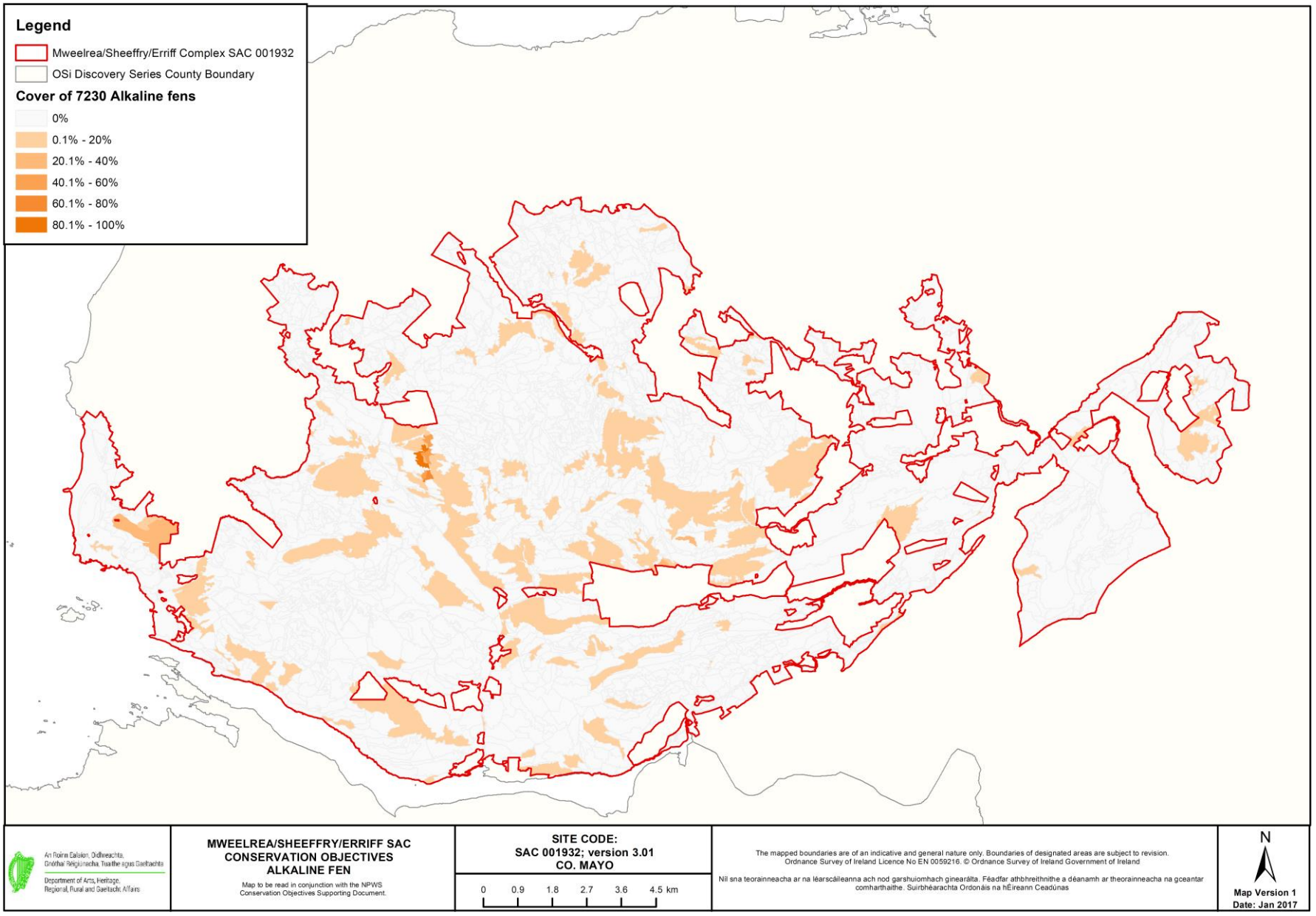
Map 5 Mweelrea/Sheeffry/Erriff Complex SAC Conservation Objectives – 7140 Transition mires



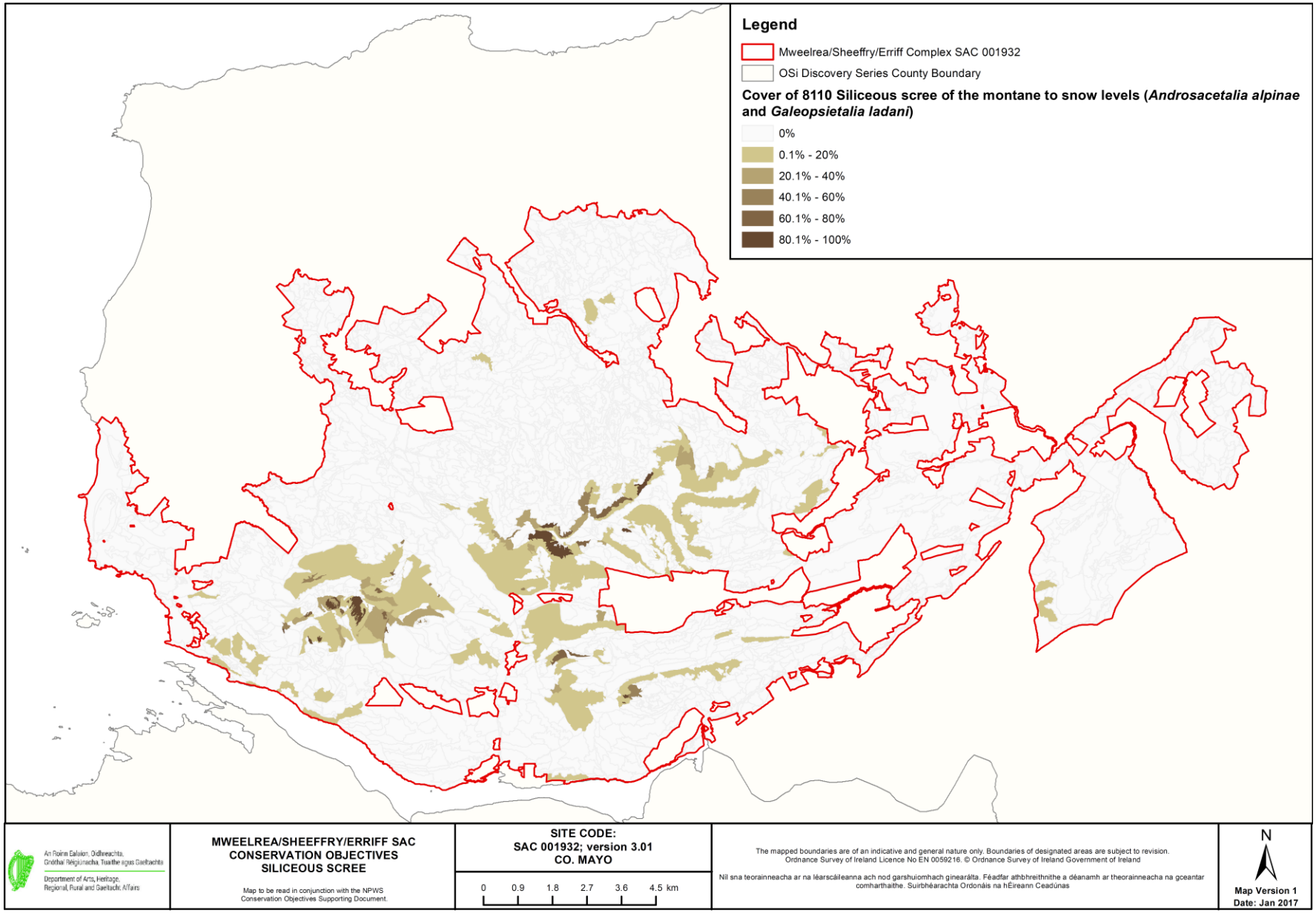
Map 6 Mweelrea/Sheeffry/Erriff Complex SAC Conservation Objectives – 7150 Rhynchosporion depressions



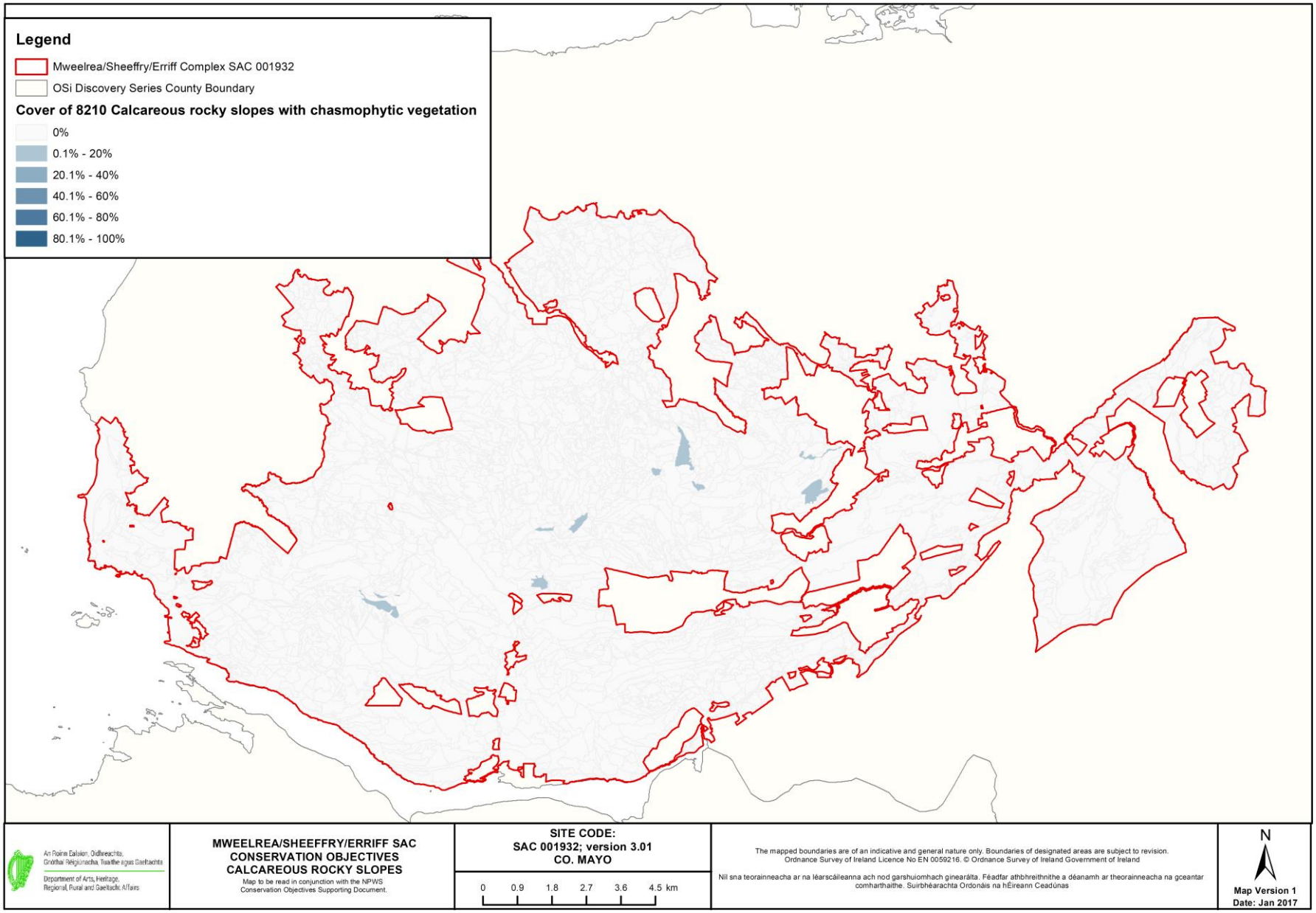
Map 7 Mweelrea/Sheeffry/Erriff Complex SAC Conservation Objectives – 7230 Alkaline fens



Map 8 Mweelrea/Sheeffry/Erriff Complex SAC Conservation Objectives – 8110 Siliceous screes



Map 9 Mweelrea/Sheeffry/Erriff Complex SAC Conservation Objectives – 8210 Calcareous rocky slopes



Map 10 Mweelrea/Sheeffry/Erriff Complex SAC Conservation Objectives – 8220 Siliceous rocky slopes