National Survey of Upland Habitats

(Phase 3, 2012-2013)

Site Report No. 12:

Arroo Mountain cSAC (001403), Co. Leitrim

Philip M. Perrin, Jenni R. Roche, Simon J. Barron, Orla H. Daly, Rory L. Hodd, Caoimhe S. Muldoon and Kristi J. Leyden

February 2013

Commissioned by National Parks and Wildlife Service

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Cover photo: Arroo Mountain viewed from across Glenade valley, Co. Leitrim, taken by Orla Daly.

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EXECUTIVE SUMMARY

- Arroo Mountain cSAC (001403) in County Leitrim was surveyed between July and September 2012 as part of the National Survey of Upland Habitats (NSUH).
- The area of the site is 39.7 km^2. Using GIS and aerial photograph interpretation, the site was divided into 1,233 polygons, each representing an area of relatively homogeneous habitat mosaic. Each polygon was surveyed on the ground to create a habitat map for the site.
- A total of 19 Annex I habitats, 47 Fossitt habitats and 71 provisional upland vegetation communities were recorded. Annex I habitats comprise 76.7% of the site. The Annex I upland habitats present which are primary focus habitats for the NSUH are *7130 Active blanket bog (52.8%), 4030 Dry heath (9.2%), 4010 Wet heath (7.7%), 4060 Alpine and Boreal heath (2.9%), 7130 Inactive blanket bog (1.9%), 8120 Calcareous scree (0.5%), 7230 Alkaline fens (0.3%), 8210 Calcareous rocky slopes (0.2%), 7150 *Rhynchosporion* depressions (0.1%), 7140 Transition mires (0.1%), 8110 Siliceous scree (0.02%) and 8220 Siliceous rocky slopes (0.001%).
- Rare and notable species recorded during the survey include *Saxifraga aizoides*, *Saxifraga oppositifolia*, *Salix phylicifolia*, *Silene acaulis*, *Polystichum lonchitis*, *Encalypta rhaptocarpa* and *Timmia norvegica.*
- Areas of botanical interest are primarily located around the edges of the site, where the underlying calcareous rock outcrops. The extensive cliffs and screes at Aghadunvane, north of the summit of Arroo, and at Keeloges and Loughmuirran to the west, support a rich range of rare calcicole species. There are small areas of alpine calcareous grassland above the cliffs at Keeloges, within which occur a number of rare species.
- The conservation status of the upland Annex I habitats that form the primary focus of the NSUH was assessed. A total of 38 monitoring stops were recorded in these habitats. The conservation status of 4060 Alpine and Boreal heaths, 7140 Transition mires, 7230 Alkaline fens and 8110 Siliceous scree were assessed as Favourable while that of the remaining primary focus habitats were assessed as Unfavourable – Bad.
- The main impacts/activities affecting the site are sheep grazing, peat cutting and peat erosion.
- It is recommended that:

  Whilst recent CFP reductions in stock numbers, implemented *c.* 2002, appears to have resulted in some improvement to Annex I habitats, continued monitoring is required to assess the recovery of these habitats. The available data do not support an increase in stocking levels.

  Appropriate regulation of turf-cutting by machine is required within the site.

  The feasibility of active restoration measures in severely eroded bog should be examined if these areas are to achieve Favourable conservation status.

* Priority Annex I habitat

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CONTENTS

MAPS ACCOMPANYING REPORT

FILES ACCOMPANYING REPORT

ESRI format polygon shapefile with habitat data

ESRI format point shapefile with waypoint data

ESRI format point shapefile with monitoring stop / relevé data

ESRI format point shapefile with rare and notable species data

Microsoft Excel format polygon attributes table

Microsoft Excel format image databank

Microsoft Access condition assessment database

Turboveg relevé database

Site, relevé and waypoint photographs

1. INTRODUCTION

Overview

1.1 The principal objectives of the National Survey of Upland Habitats (NSUH) are to classify and map the location and extent of upland habitats within a range of sites using the schemes of Fossitt (2000) and Annex I of the EU Habitats Directive, and to assess the conservation status of a suite of upland Annex I habitats. Selected sites largely comprise upland candidate Special Areas of Conservation (cSACs). The assessment procedure involves evaluation of habitat condition indicators at a network of monitoring stops (point samples) distributed across the range of these habitats at the surveyed sites.

1.2 These data are required to provide a scientific basis for the development of policies and management practices for the maintenance (or restoration) of favourable conservation status of Annex I habitats and to provide a scientific basis for monitoring of their status into the future. This site report should be read in conjunction with Irish Wildlife Manual No. 48 (Perrin *et al.,* 2010) and No. 79 (Perrin *et al*., 2014) which detail the methodologies used for all aspects of this survey. These were initially devised during a scoping study and pilot survey of upland habitats completed in 2009 (Perrin *et al*., 2009).

1.3 This report summarises the results of the field survey of Arroo Mountain cSAC (001403) for the NSUH (Phase 3, 2012-13). Section 2 of this report presents a detailed description of the habitats within the site, which should be read in conjunction with the relevant O.S. Discovery Series map and the figures associated with the report. It also contains summary statistics on the extent of each habitat type recorded and a compilation of rare and notable floral records for the site.

1.4 Section 3 presents a detailed account of the conservation assessment for the upland Annex I habitats that are the primary focus of the NSUH. This is presented on a habitat-by-habitat basis and for each habitat the parameters of area, structure and functions and future prospects are examined. Available data from the Commonage Framework Plan are also presented.

1.5 Section 4 of this report recommends amendments to the Natura 2000 Standard Data Form based on the results of this survey and makes additional recommendations in regard to monitoring and management.

1.6 Fieldwork was conducted between July and September 2012. The boundary of the cSAC as used in this survey is the version that was provided by NPWS in April 2012.

Background site information

1.7 Arroo Mountain cSAC, Co. Leitrim, (Fig. 1) is a relatively small site, being 39.7 km^2 in extent. It lies within the Dartry Mountains between the valleys of Glenade in the west and Glenaniff in the east (O.S. Discovery Series map 16). The underlying geology in the north and west of the site where the main cliffs occurs is limestone and calcareous shale, whilst in the south,

east and centre of the site it is orthoquartzitic sandstone banded by shale, laminated carbonate and evaporite. The main peak is Arroo (alt. 523 m) in the north of the site, with a lesser peak near Lough Aganny (alt. 482 m) in the centre of the site. The peak of Crocknagapple in the southeast of the massif lies outside the site boundary.

1.8 The site has been designated for a number of Annex I habitats (Table 1). The full category titles for Annex I habitats mentioned in this report are found in Appendix 1.

Table 1: Annex I habitat data from the Natura 2000 Standard Data Form for Arroo Mountain cSAC. Data retrieved from www.npws.ie 23rd October 2012. Rep. = Representativity, Surf. = Relative Surface, Cons. = Conservation status, Glob. = Global Assessment.

Annex I code	**Habitat**	**Area (%)**	**Rep.**	**Surf.**	**Cons.**	**Glob.**
4010	Wet heaths	40	A	B	A	B
*7130/7130	Blanket bogs	18	C	C	B	C
7220	Petrifying springs	1	B	C	B	B
8120	Calcareous scree	1	C	C	B	C
8210	Calcareous rocky slopes	1	A	C	A	B

2. FIELD SURVEY

Description of habitats

The limestone cliffs

2.1 At the northern end of the site, a high section of limestone cliff occurs, looking north over the townland of Aghadunvane; this is classified as **ER2 Exposed calcareous rock** in the classification scheme of Fossitt (2000). Very steep slopes, capped by a lower band of limestone cliffs, face west over Keeloges and Loughmuirran and southwest over Aghalateeve. Numerous rocky slopes also occur within an extensive area of broken, undulating ground below the cliffs at Aghadunvane. The drier ledges on the cliffs support a rank sward of *Sesleria caerulea* and *Carex flacca* (**GS1 Dry calcareous and neutral grassland**), whilst hydrophilous tall herb communities with *Alchemilla glabra*, *Crepis paludosa*, *Festuca rubra* and large moss species including *Breutelia chrysocoma* and *Calliergonella cuspidata* occur on wetter ledges. On the face of the cliffs can be found *Asplenium trichomanes*, *Ctenidium molluscum*, *Cystopteris fragilis*, *Hieracium* spp., *Saxifraga rosacea, Saxifraga aizoides* and *Saxifraga oppositifolia.* Many of the cliffs overlooking Aghadunvane are particularly wet, and support a limited suite of species in some places.

2.2 At the foot of the cliffs are areas of calcareous scree (**ER4 Calcareous scree and loose rock**) supporting a similar suite of species to the cliff face with *Geranium robertianum* also frequent. The scree slopes above Keeloges and Aghalateeve are particularly mobile and loose, resulting in a limited flora being present. Also beneath the cliffs occurs tightly grazed calcareous grassland (**GS1 Dry calcareous and neutral grassland**) with *Festuca ovina* and *Thymus polytrichus* and, in places, **HH2 Calcareous heath**, within which numerous herb species are frequent. Further downslope from the cliffs the grassland becomes more acidic, being characterised by *Agrostis capillaris* or *Nardus stricta*. These areas of **GS3 Dry-humid acid grassland** form a mosaic with **GS4 Wet grassland**, which is dominated by *Juncus* spp..

2.3 Above the cliffs at Loughmuirran, areas of **GS1 Dry calcareous and neutral grassland** also occur and, where the ground becomes rockier, dense cushions of *Silene acaulis* can be found, in association with *Saxifraga oppositifolia* and the extremely rare moss *Encalypta rhaptocarpa*.

The plateau

2.4 The vast majority of the plateau is **PB2 Upland blanket bog** with *Calluna vulgaris*, *Eriophorum vaginatum*, *Eriophorum angustifolium* and *Trichophorum germanicum*. On steeper ground this transitions into **HH1 Dry siliceous heath** dominated by *C. vulgaris*. This habitat is particularly frequent on the southwest slopes overlooking Glenade Lough. On the most exposed higher ground that runs along the centre of the plateau from the northwest to the southeast, areas of **HH4 Montane heath** characterised by *C. vulgaris, Erica cinerea*, *Racomitrium lanuginosum* and *Cladonia* spp. are found.

2.5 In the south of the site near the townlands of Cloghmeen and Rassaun, **HH3 Wet heath** is abundant with species including *Calluna vulgaris*, *Erica cinerea*, *Erica tetralix, Molinia caerulea*, *Trichophorum germanicum*, *Carex panicea* and *Sphagnum capillifolium*. Also to be found in the

valley near Cloghmeen are flushes with *Carex rostrata*, *Carex echinata*, *Carex nigra*, *Menyanthes trifoliata and Sphagnum inundatum* (**PF3 Transition mire and quaking bog**).

2.6 Dotted across the plateau are around a dozen small loughs, the largest being Arroo Lough in the north, Lough Nabrack in the centre and Sandy Lough in the south. These are **FL1 Dystrophic lakes** and **FL2 Acidic oligotrophic lakes**. Numerous streams (**FW1 Eroding / upland rivers**) also flow down from the plateau, forming deep, incised, often wooded river valleys.

2.7 Numerous rich flushes (**PF1 Rich fen and flush**) occur scattered throughout the site, usually as small features within the greater bog and heath mosaic, and support small sedge and brown moss species including *Carex viridula*, *Carex panicea*, *Scorpidium scorpioides*, *Scorpidium revolvens* and *Warnstorfia sarmentosa*.

2.8 A selection of photographs taken during fieldwork of landscapes, habitats and species are presented in Appendix 2.

Habitat statistics

2.9 The NSUH maps habitats and vegetation communities on a polygon basis. Following aerial photograph interpretation, a survey site is divided into numerous polygons based on areas of homogeneous patternation and topography. The majority of these polygons represent mosaics of habitats rather than single habitats. Each polygon is surveyed on the ground and the habitats and vegetation communities present in each are listed and their percentage cover estimated. For further details see Perrin *et al.* (2009; 2014). The field maps for this site, which present the amended and numbered polygons, accompany this report (Field maps 1-8).

2.10 The most abundant habitat within a polygon is termed the primary habitat. The primary Fossitt habitat types for Arroo Mountain cSAC are shown in Fig. 2 and the primary Annex I habitat types are presented in Fig. 3. It is important to note that these maps do not convey the full complexity of habitats within the site. For full details of the habitat composition of each polygon refer to the polygon attribute table associated with the GIS. This information also accompanies this report in Microsoft Excel format.

2.11 A total of 47 Fossitt (2000) habitats were recorded during this survey within Arroo Mountain cSAC and details of their coverage are presented in Table 2. **PB2 Upland blanket bog** was the most extensive habitat, covering 54.7% of the site, followed by **HH1 Dry siliceous heath** at 9.2%, **GS3 Dry-humid acid grassland** at 7.7% and **HH3 Wet heath** at 7.7%.

2.12 A total of 19 Annex I habitats were recorded during this survey within Arroo Mountain cSAC, covering 76.8% of the site (Table 3). The main Annex I habitat was ***7130 Active blanket bog** which covered 52.8% of the site, followed by **4030 Dry heath** and **4010 Wet heath** which covered 9.2% and 7.7% of the site respectively. The next most frequent habitat was **4060 Alpine and Boreal heath** at 2.9%. Note that significant areas of non-Annex

Table 2: Extent of Fossitt habitats within Arroo Mountain cSAC.

Fossitt code	Habitat	Area (ha)	% of site
BL1	Stone walls and other stonework	1.0	0.03
BL2	Earth banks	0.04	0.001
BL3	Buildings and artificial surfaces	0.4	0.01
ED1	Exposed sand, gravel or till	9.1	0.2
ED2	Spoil and bare ground	24.0	0.6
ED3	Recolonising bare ground	2.6	0.07
ER1	Exposed siliceous rock	1.5	0.04
ER2	Exposed calcareous rock	15.5	0.4
ER3	Siliceous scree and loose rock	37.2	0.9
ER4	Calcareous scree and loose rock	31.5	0.8
FL1	Dystrophic lakes	5.4	0.1
FL2	Acid oligotrophic lakes	20.1	0.5
FP1	Calcareous springs	3.6	0.09
FP2	Non-calcareous springs	1.0	0.02
FS1	Reed and large sedge swamps	0.1	0.002
FW1	Eroding/upland rivers	10.2	0.3
FW4	Drainage ditches	0.09	0.002
GA1	Improved agricultural grassland	9.7	0.3
GM1	Marsh	0.5	0.01
GS1	Dry calcareous and neutral grassland	62.5	1.6
GS3	Dry-humid acid grassland	304.9	7.7
GS4	Wet grassland	179.4	4.5
HD1	Dense bracken	19.0	0.5
HH1	Dry siliceous heath	363.8	9.2
HH2	Dry calcareous heath	1.4	0.03
HH3	Wet heath	304.4	7.7
HH4	Montane heath	127.5	3.2
PB2	Upland blanket bog	2171.5	54.7
PB3	Lowland blanket bog	7.7	0.2
PB4	Cutover bog	4.1	0.1
PB5	Eroding blanket bog	89.0	2.2
PF1	Rich fen and flush	16.0	0.4
PF2	Poor fen and flush	89.4	2.3
PF3	Transition mire and quaking bog	4.6	0.1
WD1	(Mixed) broadleaved woodland	0.5	0.01
WD2	Mixed broadleaved/conifer woodland	0.8	0.02
WD3	(Mixed) conifer woodland	2.7	0.07
WD4	Conifer plantation	6.8	0.2
WD5	Scattered trees and parkland	2.3	0.06
WL1	Hedgerows	1.3	0.03
WL2	Treelines	3.7	0.09
WN1	Oak-birch-holly woodland	1.4	0.04
WN2	Oak-ash-hazel woodland	15.1	0.4

Table 2: continued.

Fossitt code	Habitat	Area (ha)	% of site
WN6	Wet willow-alder-ash woodland	3.3	0.08
WS1	Scrub	11.7	0.3
WS5	Recently-felled woodland	0.1	0.003
	Total site area	3967.9	

Table 3: Extent of Annex I habitats within Arroo Mountain cSAC. *denotes priority habitat.

Annex I code	Habitat	Area (ha)	% of site
3130	Upland oligotrophic lakes	20.1	0.5
3160	Dystrophic lakes	4.5	0.1
4010	Wet heath	304.4	7.7
4030	Dry heath	363.4	9.2
4060	Alpine and Boreal heath	117.0	2.9
6170	Alpine and subalpine calcareous grasslands	0.3	0.01
6210	Calcareous grasslands	8.2	0.2
6430	Hydrophilous tall herb communities	0.3	0.01
*7130	Active blanket bog	2096.3	52.8
7130	Inactive blanket bog	78.6	2.0
7140	Transition mires	4.6	0.1
7150	*Rhynchosporion* depressions	4.1	0.1
*7220	Petrifying springs with tufa formation	0.9	0.02
7230	Alkaline fens	12.0	0.3
8110	Siliceous scree	0.6	0.02
8120	Calcareous scree	21.4	0.5
8210	Calcareous rocky slopes	6.6	0.2
8220	Siliceous rocky slopes	0.04	0.001
*8240	Limestone pavements	2.5	0.1
	non-Annex I habitats	922.2	23.3
	Total site area	3967.9	
	Total area of Annex I habitats	3045.6	76.8

habitats may occur within an SAC. These may occur in intimate mosaic with Annex I habitats. They may have an important protective or support function in relation to associated Annex habitats, be the target of restoration objectives or improve the coherence and connectivity between fragmented areas of Annex I habitat.

2.13 A total of 97 provisional upland vegetation communities and sub-communities (Perrin *et al.,* 2014) were recorded within Arroo Mountain cSAC. Details of their coverage are presented in Table 4.

Table 4: Extent of provisional vegetation communities within Arroo Mountain cSAC.

Code	Provisional communities and sub-communities	Area (ha)	% of site	% of habitat
PO1	*Menyanthes trifoliata - Carex limosa* pool community			
PO1a	infilling pool sub-community	0.1	0.001	23.9
PO1b	aquatic sub-community	0.2	0.005	76.1
SW1	*Potamogeton polygonifolius* soakway	2.0	0.1	100
SPG1	*Philonotis fontana - Saxifraga stellaris* spring			
SPG1a	typical sub-community	0.6	0.01	13.0
SPG1b	species-poor *Sphagnum denticulatum* sub-community	0.4	0.01	8.1
SPG2	*Palustriella commutata* spring			
SPG2i	Annex I variant	0.9	0.02	19.3
SPG2ii	non-Annex I variant	2.7	0.1	59.6
PFLU1	*Carex nigra/echinata - Sphagnum denticulatum* flush	9.0	0.2	3.4
PFLU2	*Juncus effusus - Sphagnum cuspidatum/palustre* flush	77.4	2.0	29.5
PFLU3	*Juncus acutiflorus/effusus - Calliergonella cuspidata* flush	171.5	4.3	65.5
PFLU4	*Molinia caerulea - Sphagnum palustre* flush			
PFLU4a	typical sub-community	0.1	0.002	0.03
PFLU5	*Carex rostrata – Sphagnum* spp. flush	4.0	0.1	1.5
RFLU1	*Carex viridula oedocarpa - Pinguicula vulgaris - Juncus bulbosus* flush			
RFLU1a	brown moss sub-community	11.8	0.3	71.6
RFLU1b	species-poor sub-community	4.0	0.1	24.1
RFLU2	*Eleocharis quinqueflora - Carex viridula* flush	0.02	0.0005	0.1
RFLU4	*Schoenus nigricans – Scorpidium scorpioides* flush	0.1	0.002	0.5
RFEN	*Carex rostrata* fen			
RFEN1a	species-rich sub-community	0.1	0.003	0.7
RFEN1b	species-poor sub-community	0.5	0.01	2.9
UG1	*Agrostis capillaris - Festuca ovina* upland grassland			
UG1a	typical sub-community	91.4	2.3	24.7
UG1b	*Sphagnum* spp. sub-community	2.2	0.1	0.6
UG1d	*Juncus squarrosus* sub-community	122.4	3.1	33.1
UG2	*Nardus stricta - Galium saxatile* upland grassland			
UG2a	typical sub-community	47.9	1.2	12.9
UG2b	*Sphagnum* spp. sub-community	1.8	0.05	0.5
UG2d	*Juncus squarrosus* sub-community	39.2	1.0	10.6
UG3	*Silene acaulis* alpine grassland	0.3	0.01	0.1
UG4	*Molinia caerulea – Anthoxanthum odoratum* wet grassland	2.1	0.1	0.6
UG5	*Festuca ovina – Agrostis capillaris – Thymus praecox* calcareous grassland			
UG5a	herb-rich sub community	8.2	0.2	2.2
UG5b	herb-poor sub community	48.1	1.2	13.0
UG6	*Sesleria caerulea – Carex flacca* calcareous grassland	5.8	0.1	1.6
BK1	*Pteridium aquilinum* community	19.0	0.5	100
DH3	*Calluna vulgaris - Erica cinerea* dry heath	265.6	6.7	73.1
DH4	*Calluna vulgaris - Sphagnum capillifolium* dry /damp heath	83.8	2.1	23.1
DH5	*Calluna vulgaris – Antennaria dioica* heath	1.4	0.03	0.4
DH6	*Calluna vulgaris -Vaccinium myrtillus* dry heath	12.5	0.3	3.4

Table 4: continued.

Code	Provisional communities and sub-communities	Area (ha)	% of site	% of habitat
WH1	*Schoenus nigricans - Erica tetralix* wet heath			
WH1a	continuous cover sub-community	0.2	0.004	0.1
WH1b	open sub-community	0.1	0.002	0.03
WH2	*Trichophorum germanicum - Cladonia* spp. - *Racomitrium lanuginosum* wet heath	0.2	0.005	0.1
WH3	*Calluna vulgaris - Molinia caerulea - Sphagnum capillifolium* wet/damp heath	35.9	0.9	11.8
WH4	*Trichophorum germanicum- Eriophorum angustifolium* wet heath			
WH4a	typical sub-community	52.4	1.3	17.2
WH4b	*Calluna vulgaris* sub-community	160.7	4.0	52.8
WH4c	*Juncus squarrosus* sub-community	11.9	0.3	3.9
WH5	*Trichophorum germanicum - Nardus stricta - Racomitrium lanuginosum* montane wet heath	32.5	0.8	10.7
WH6	*Schoenus nigricans – Molinia caerulea – Myrica gale* wet heath	10.6	0.3	3.5
MH1	*Calluna vulgaris - Racomitrium lanuginosum* montane heath			
MH1a	typical sub-community	97.2	2.4	76.3
MH1b	*Juncus squarrosus* sub-community	18.9	0.5	14.8
MH3	*Vaccinium myrtillus - Rhytidiadelphus loreus - Anthoxanthum odoratum* montane heath	0.9	0.02	0.7
MH5	*Nardus stricta - Carex binervis - Racomitrium lanuginosum* montane grass-heath	10.4	0.3	8.1
MH8	*Festuca vivipara – Thymus polytrichus – Galium saxatile* montane vegetation	0.1	0.003	0.1
BB1	*Schoenus nigricans - Eriophorum angustifolium* bog			
BB1a	continuous cover sub-community	2.7	0.1	0.1
BB2	*Schoenus nigricans – Sphagnum* spp. bog	0.3	0.01	0.02
BB3	*Eriophorum vaginatum – Sphagnum papillosum* bog	20.3	0.5	0.1
BB4	*Trichophorum germanicum - Eriophorum angustifolium* bog	1067.7	26.9	51.4
BB5	*Calluna vulgaris - Eriophorum* spp. Bog			
BB5a	typical sub-community	805.1	20.3	38.8
BB5b	*Juncus squarrosus* sub-community	180.8	4.6	8.7
HW1	*Sphagnum denticulatum/cuspidatum* hollow			
HW1i	upland variant	19.3	0.5	18.7
HW1iii	flush variant	0.5	0.01	0.5
HW2	*Eriophorum angustifolium - Sphagnum fallax* hollow			
HW2i	upland variant	78.2	2.0	76.0
HW2ii	lowland variant	0.4	0.01	0.4
HW3	*Rhynchospora alba* hollow	4.1	0.1	0.4
HW4	*Eleocharis multicaulis* hollow			
HW4i	bog variant	0.2	0.01	0.2
HW4ii	flush variant	0.3	0.01	0.3
DP1	*Campylopus introflexus - Polytrichum* spp. degraded peat community	2.6	0.1	86.5
DP2	*Nardus stricta – Eriophorum angustifolium* degraded peat community	0.4	0.01	13.5
TH1	*Luzula sylvatica - Vaccinium myrtillus* tall herb vegetation			
TH1i	rock face variant	0.3	0.01	11.6
TH1ii	dry heath variant	1.8	0.05	77.2
TH2	*Cochlearia pyrenaica* tall herb vegetation	0.002	0.0001	0.1
TH3	*Sedum rosea - Angelica sylvestris* tall herb vegetation	0.3	0.01	11.1

Table 4: continued.

Code	Provisional communities and sub-communities	Area (ha)	% of site	% of habitat
SC1	Siliceous scree community	0.02	0.001	2.6
SC2	Calcareous scree community	1.2	0.02	97.4
RS1	*Saxifraga spathularis - Asplenium adiantum-nigrum* rock cleft community	0.01	0.0002	2.1
RS2	*Saxifraga aizoides - Asplenium* spp. - *Orthothecium rufescens* rock cleft community	0.4	0.01	97.9
HM1	*Calluna vulgaris – Scapania gracilis* hepatic mat			
HM1i	non-Annex I grassland variant	0.004	0.0001	3.0
HM1ii	Annex I grassland variant	0.003	0.0001	2.3
HM1iii	dry heath variant	0.1	0.002	55.1
HM1iv	wet heath variant	0.004	0.0001	3.1
HM1vi	non-Annex I siliceous rock variant	0.01	0.0002	5.9
HM1vii	Annex I siliceous rock variant	0.001	0.00003	1.0
HM1ix	upland bog variant	0.04	0.001	29.7
	Total area of vegetation communities	3686.6	93.0	
	Not covered	70.2	1.8	
	Non-vegetation cover types	242.0	6.1	
	Total site area	3967.9		

2.14 Gradated maps displaying the cover of Annex I habitats currently assessed under the NSUH plus **6170 Alpine and subalpine calcareous grasslands** and **6430 Hydrophilous tall herb communities** are shown in Figs. 4a-n. These maps present the actual distributions of individual habitats within the site which may be masked in the primary habitat maps which show only the most extensive habitat in each polygon.

Rare and notable flora

2.15 Rare and notable plant records for the site are listed in Table 5 and their locations, where accurately known, are presented in Figs. 5a-b. The list is compiled from records made during the present survey and from existing records. For each species it is indicated whether it is listed on the Flora Protection Order, 1999 and/or the relevant Red Data List. For vascular plants this is Curtis & McGough (1988) and for bryophytes it is Lockhart *et al*. (2012). For lichens a preparatory list provided by D. McFerran, National Museums Northern Ireland was used; this is very much provisional and IUCN status has not been assigned to these species. Notable records comprise plants which are not rare but are of particular interest in an upland context.

2.16 Some rare arctic-alpines were recorded during the NSUH at this site. These include *Polystichum lonchitis*, *Salix phylicifolia*, *Saxifraga aizoides*, *Saxifraga oppositifolia* and *Silene acaulis*. The majority of these species were recorded from the extensive calcareous cliffs to the north of the summit of Arroo. The exception is *S. acaulis*, which occurs in calcareous grassland above the cliffs at Keeloges.

Table 5: Records of rare and notable plant species from Arroo Mountain cSAC.

Species	Red Data List	FPO	Annex II	Year of record (s)	NSUH	Previous records
Vascular plants						
Adiantum capillus-veneris	-	-	-	1971		1
Cystopteris fragilis	-	-	-	2012	•	-
Draba incana	RA	-	-	2005		1, 2, 3, 4
Dryas octopetala	-	-	-	?		3, 4
Gnaphalium sylvaticum†	RA	•	-	1905		1
Oxyria digyna	-	-	-	?		3, 4
Polystichum lonchitis	RA	-	-	?, 2012	•	4
Pseudorchis albida	VU	•	-	1956		1
Salix phylicifolia	RA	-	-	1885, 1993, 2005, 2012	•	1, 2, 4, 5
Saxifraga aizoides	RA	-	-	2000, 2005, 2007, 2012	•	1, 2, 3, 4
Saxifraga hypnoides	-	-	-	?		3, 4
Saxifraga oppositifolia	RA	-	-	1885, 2000, 2005, 2012	•	1, 2, 3, 4
Saxifraga rosacea	-	-	-	2012	•	-
Silene acaulis	RA	-	-	?, 2012	•	4
Bryophytes						
Cinclidium stygium	VU	-	-	2000		1, 6
Dicranella grevilleana	NT	-	-	1930, 1970, 2000, 2005		1, 2, 4
Didymodon maximus	NT	-	-	1970, 2000, 2005		1, 2, 4, 6
*Encalypta rhaptocarpa**	CE	-	-	2012	•	-
Hymenostylium recurvirostrum var. *insigne*	NT	-	-	1970, 2000, 2005		1, 2, 4
Mnium marginatum var. marginatum	-	-	-	2005, 2012	•	1
Mnium thomsonii	NT	-	-	1965, 2005, 2012	•	1, 2, 4
Orthothecium rufescens	NT	-	-	?, 2012	•	2, 4
Pedinophyllum interruptum	-	-	-	?, 2012	•	4
*Polytrichastrum alpinum**	-	-	-	2012	•	-
Schistidium robustum	DD	-	-	2005		1, 6
Schistidium trichodon	VU	-	-	2005		1, 6
*Scorpidium scorpioides**	-	-	-	2012	•	-
Seligeria oelandica	VU	-	-	1970, 2000, 2005		1, 2, 4
Seligeria patula/trifaria	NT	-	-	1970, 2000, 2012	•	1, 2, 4
*Sphagnum capillifolium subsp. capillifolium**	DD	-	-	2012	•	-
Sphagnum girgensohnii	NT	-	-	2012	•	-
*Sphagnum platyphyllum**	NT	-	-	2012	•	-
Sphagnum russowii	NT	-	-	2012	•	-
Timmia norvegica	VU	-	-	2000, 2005, 2012	•	1
Tortella bambergeri	-	-	-	2005		1
*Warnstorfia sarmentosa**	-	-	-	2012	•	-

† Occurs just outside the site

* Denotes new or updated vice county record from NSUH fieldwork

Previous records: 1, NPWS Recorder database and associated data
2, Natura 2000 Standard Data Form
3, cSAC site synopsis
4, NPWS Conservation Statement
5, Cotton & Cawley (1993)
6, Lockhart *et al.* (2012)

Red Data List: CR, Critically Endangered
VU, Vulnerable
NT, Near Threatened
RA, Rare
DD, Data Deficient

2.17 The majority of previously recorded rare plants were rediscovered during the present survey. Rare species not rediscovered were *Draba incana*, *Dryas octopetala*, *Adiantum capillus-veneris*, *Pseudorchis albida* and *Gnaphalium sylvaticum*. The latter two species were found in lowland areas at the margins of the site, and have not been recorded at these localities since 1956 and 1905, respectively. *Cardaminopsis petraea* is erroneously listed in the Conservation Statement for this site.

2.18 Rare bryophytes recorded during the survey include the Critically Endangered *Encalypta rhaptocarpa*, which has only one other recent Irish record, on Benbradagh in Co. Derry. The species was last recorded in Gleniff and on Benbulbin in Co. Sligo in 1963, with the only previous, imprecise, record for Co. Leitrim being from near Largydonnell in 1909 (Lockhart *et al*., 2012). The new record was from **6170 Alpine and subalpine calcareous grassland** above the cliffs at Keeloges. *Mnium thomsonii* was also recorded in this grassland. The Near Threatened mosses *Orthothecium rufescens* and *Seligeria trifaria* agg. and the Vulnerable *Timmia norvegica* were recorded from the limestone cliffs north of the summit of Arroo. A number of Near Threatened bryophyte species were recorded from locations throughout the site, and some new vice-county records were also made.

2.19 Previous rare bryophyte records are primarily from the calcareous northern cliffs. The Vulnerable species *Seligeria oelandica* and *Schistidium trichodon* were last recorded in 2005 and *Cinclidium stygium* was last recorded in 2000. A number of highly restricted Near Threatened species have previously been recorded from Arroo, including *Didymodon maximus*, *Dicranella grevilleana* and *Hymenostylium recurvirostre* var. *insigne*, but were not recorded during the NSUH. Reference to *Plagiothecium curvifolium* in the Conservation Statement for the site is erroneous.

2.20 The NSUH survey did not actively seek to relocate previous rare plant records; therefore no inference should be made from the absence of a record in the current survey.

2.21 A list of the scientific and common names of all vascular plants, bryophytes and lichens recorded during the survey of this site are presented in Appendix 3.

Fauna

2.22 Faunal records during this survey include Fox (*Vulpes vulpes*), Irish hare (*Lepus timidus hibernicus*), Common lizard (*Zootoca vivipara*) and Common frog (*Rana temporaria*). Chough (*Pyrrhocorax pyrrhocorax*) and Golden plover (*Pluvialis apricaria*) both species listed on Annex I of the EU Birds Directive were observed within the site. Other birds noted include Dipper (*Cinclus cinclus*), Raven (*Corvus corax*), Red grouse (*Lagopus lagopus*) and the butterflies Painted lady (*Vanessa cardui*) and Peacock butterfly (*Inachis io*).

2.23 Previous faunal records include Badger (*Meles meles*), Rabbit (*Oryctolagus cuniculus*), and Otter (*Lutra lutra*) a species listed on Annex II of the EU Habitats Directive. Peregrine falcon (*Falco peregrinus*), Merlin (*Falco columbarius*), and Hen harrier (*Circus cyaneus*), all listed on Annex I of the EU Birds Directive were also present. Other bird species recorded in the site included Kestrel (*Falco tinnunculus*), Hooded crow (*Corvus cornix*), Meadow pipit (*Anthus*

pratensis), Skylark (*Alauda arvensis*), Snipe (*Gallinago gallinago*) and Woodcock (*Scolopax rusticola*).

3. CONSERVATION ASSESSMENT

3.1 The conservation status of Annex I habitats that form the primary focus of the NSUH was assessed using the methodology detailed in Perrin *et al*. (2014). The assessments comprise three parameters: area, structure and functions, and future prospects. The area parameter examines gains or losses in an Annex I habitat. The structure and functions parameter examines the vegetation composition and structure of the habitats and the physical structure of the substrate. A total of 38 monitoring stops were recorded within Arroo Mountain cSAC for this purpose (Fig. 6 and Table 6); 2 additional relevés were recorded in habitats that were assessed. The future prospects parameter examines the current impacts to the site that are affecting area and structure and functions, and predicts the future status of the habitat based on future trends where there is sufficient data. The future prospects parameter can also be informed by available data from the Commonage Framework Plan project (CFP).

Table 6: The number of monitoring stops recorded in primary focus Annex I habitats

Annex I code	Habitat	Number of stops
4010	Wet heath	5
4030	Dry heath	6
4060	Alpine and Boreal heath	4
*7130/7130	Blanket bog	11
7140	Transition mires	1
7150	*Rhynchosporion* depressions	1
7230	Alkaline fens	2
8110	Siliceous scree	1
8120	Calcareous scree	3
8210	Calcareous rocky slopes	4

Commonage Framework Plan

3.2 Surveys were initiated in 1998 to assess livestock impacts on commonages in Ireland and to devise Commonage Framework Plans (CFP) to improve commonage condition. Assessments were made on an area basis by dividing the commonage into subunits based on areas of a consistent level of damage. Point sample assessments were made at a series of stations, of 10 x 10 m, within the subunits. The habitats identified by the CFP relevant to the NSUH sites were blanket bog, wet heath, dry heath and upland grassland. The damage assessment scale used was undamaged (U), moderately damaged to undamaged (MU), moderately damaged (MM), moderately to severely damaged (MS), severely damaged (S) or very severely damaged (S*). Further details of CFP methodology can be found in Anon. (1998) and use of this data by the NSUH has been reviewed by Perrin (2012).

3.3 Arroo Mountain cSAC is largely commonage with these areas comprising 29.2 km^2 or 73.6% of the site. A baseline CFP survey of the majority of these areas occurred in 1999 with further smaller areas surveyed in 2003, 2005 and 2009. An interim destocking level of 30% had been applied in Leitrim prior to the CFP commencing. This was then adjusted using available

CFP results *c.*2004. Results from this baseline survey are shown in Fig. 7. There has been no resurvey of this site.

3.4 The CFP baseline survey recorded 33 subunits within or partially within Arroo Mountain cSAC (Table 7). These indicate commonage within the site was in rather poor condition at this time with 70.4% of the area being undamaged (U), but with 21.8% of the area being severely or very severely damaged (S/S*).

Table 7: Frequency and area of CFP subunit damage levels in the Arroo Mountain cSAC baseline survey

Damage level	Frequency (*n* = 34)	Area %
U	26 (75.8%)	70.4
MU	4 (12.1%)	8.4
MM	0 (0.0%)	0.0
MS	0 (0.0%)	0.0
S/S*	4 (12.1%)	21.2

3.5 The CFP recorded 17 stations within Arroo Mountain cSAC, although data was only available for 16 stations (Table 8). These also indicate commonage within the site was in rather poor condition at this time with 56.3% of stations being undamaged (U) but with 31.3% of stations being severely damaged or very severely damaged (S/S*).

Table 8: Frequency of CFP station damage level in the Arroo Mountain cSAC baseline survey. Percentages indicate proportion of stations within each column.

Damage level	Wet heath/Dry heath/ Blanket bog (*n* = 13)	Upland grassland (*n* = 3)	All habitats (*n* = 16)
U	7 (53.8%)	2 (66.6%)	9 (56.3%)
MU	1 (7.7%)	1(33.3%)	2 (12.5%)
MM	0 (0.0%)	0 (0.0%)	0 (0.0%)
MS	0 (0.0%)	0 (0.0%)	0 (0.0%)
S/S*	5 (38.5%)	0 (0.0%)	5 (31.3%)

3.6 Summary data for some of the key indicators recorded at CFP stations are compared with NSUH data in Table 9. They suggest that there has been a decrease in the area of bare peat and an increase in sward height and *Calluna* height. However, they also suggest that there has been a decrease in *Calluna* cover.

3.7 The analysis of key indicator values is rather inconclusive and as there has been no CFP resurvey of this site it not possible to derive much from the other data. However, the fact that CFP reductions in stock numbers occurred in over 29% of the commonage may be seen as a positive trend for **4010 Wet heaths**, **4030 Dry heaths** and ***7130/7130 Blanket bogs** and other habitats where grazing has been recorded as an impact

Table 9: Mean values for key indicators from CFP stations in the Arroo Mountain cSAC baseline survey (1999-2009) with related data from NSUH survey (2012) .

	Wet heath/Dry heath/ Blanket bog		**Upland grassland and other habitats**
	CFP (*n* = 13)	**NSUH (*n* = 27)**	**CFP (*n* = 3)**
Bare peat cover (%)	14.8	5.6	0.3
Sward height (cm)	7.0	23.1	20.3
Calluna height (cm)	14.0	19.2†	-
Calluna cover			-
D (>50%)	7 (53.8%)	10 (37.0%)	-
A (26-50%)	1 (7.7%)	8 (29.6%)	-
O or F (≤25%)	5 (38.5%)	9 (33.3%)	-
Absent	0 (0.0%)	0 (0.0%)	-
Not recorded	0 (0.0%)	0 (0.0%)	-

† Dwarf shrub height is used here as an estimate of *Calluna* height

4010 Wet heaths

Area

3.8 Changes in the area of **4010 Wet heaths** were recorded for the period 1995 to 2012 through a combination of observations in the field and analysis of aerial photographs and satellite imagery available through Google Earth. This analysis is restricted to obvious changes in habitat; less obvious changes from one habitat type to another cannot be reliably identified by this process. Erosion has resulted in loss of habitat, but due to the gradual and diffuse nature of this impact it was impractical to measure the area lost. However it is estimated that the overall change in habitat area was a loss of less than 1% per year resulting in a status of Unfavourable – Inadequate. These impacts and trends are discussed later under future prospects.

Structure and functions

3.9 Five monitoring stops were recorded in **4010 Wet heaths** within Arroo Mountain cSAC (Table 10). In the assessment of structure and functions, three monitoring stops failed one criterion or more. Following a review of the ecological condition of the stops that failed one criterion or more, expert judgement determined that no changes should be made, resulting in an overall failure rate of 60.0%. The structure and functions of **4010 Wet heaths** were therefore assessed as Unfavourable – Bad.

3.10 The vegetation composition of one **4010 Wet heaths** monitoring stop (20.0%) was poor. The cover of *Cladonia* spp., *Sphagnum* spp., *Racomitrium lanuginosum* and pleurocarpous mosses within the monitoring stop was inadequate, as was the cover of ericoid species. The cover of the non-native moss species, *Campylopus introflexus*, was excessive both within the monitoring stop and in the local vicinity.

Table 10: Monitoring criteria and failure rates for 4010 Wet heaths (*n* = 5).

Criteria		Scale of assessment	Number of assessments	Number of failures	Failure rate (%)
Vegetation composition					
1	*Erica tetralix* present	20m radius	5	0	0
2	Cover of positive indicator species ≥ 50%	Relevé	5	0	0
3	Total cover of *Cladonia* species, *Sphagnum* species, *Racomitrium lanuginosum* and pleurocarpous mosses ≥ 10%	Relevé	5	1	20.0
4	Cover of ericoid species and *Empetrum nigrum* ≥ 15%	Relevé	5	1	20.0
5	Cover of dwarf shrub species < 75%	Relevé	5	0	0
6	Cover of the following negative indicator species: *Agrostis capillaris, Holcus lanatus, Phragmites australis, Ranunculus repens* collectively < 1%	Relevé	5	0	0
7	Cover of non-native species < 1%	Relevé	5	1	20.0
8	Cover of non-native species < 1%	Local vicinity	5	1	20.0
9	Cover of scattered native trees and scrub < 20%	Local vicinity	5	0	0
10	Cover of *Pteridium aquilinum* < 10%	Local vicinity	5	0	0
11	Cover of *Juncus effusus* < 10%	Local vicinity	5	0	0
Vegetation structure					
12	Crushed, broken and/or pulled up *Sphagnum* species < 10% of *Sphagnum* cover	Relevé	3	0	0
13	Last complete growing season's shoots of ericoids, *Empetrum nigrum* and *Myrica gale* showing signs of browsing collectively < 33%	Relevé	5	0	0
14	No signs of burning into the moss, liverwort or lichen layer, or exposure of peat surface due to burning	Local vicinity	5	0	0
15	No signs of burning inside boundaries of sensitive areas*	Local vicinity	5	0	0
Physical structure					
16	Cover of disturbed bare ground < 10%	Relevé	5	2	40.0
17	Cover of disturbed bare ground < 10%	Local vicinity	5	3	60.0
18	Area showing signs of drainage resulting from heavy trampling or tracking or ditches < 10%	Local vicinity	5	0	0

*Sensitive areas
(a) Vegetation severely wind-clipped, mostly forming a mat less than 10 cm thick.
(b) Areas where soils are thin and less than 5 cm deep.
(c) Slopes greater than 1 in 3 (18°) and all the sides of gullies.
(d) Ground with abundant, and/or an almost continuous carpet of *Sphagnum*, liverworts and/or lichens.
(e) Pools, wet hollows, haggs and erosion gullies, and within 5 – 10 m of the edge of watercourses.
(f) Areas above 400 m in altitude.
(g) Areas within 50 m of functioning drains.

3.11 The vegetation structure of **4010 Wet heaths** was good, with no failures being recorded under the relevant criteria. Grazing levels were found to be within acceptable limits at all **4010 Wet heaths** monitoring stops.

3.12 The physical structure of **4010 Wet heaths** was poor in most cases, with excessive cover of disturbed bare ground being recorded within 40.0% of monitoring stops and in the local

vicinity of 60.0% monitoring stops. This is likely to have been primarily caused by trampling by sheep.

Future prospects

3.13 The impacts codes (Ssymank, 2009) and associated data recorded for **4010 Wet heath** are presented in Table 11. Three significant impacts were recorded within **4010 Wet heaths**.

Table 11: Assessment of impacts for 4010 Wet heaths. Under trend, Imp = Improving, Ins = Insufficient data.

Impact code	Impact	Intensity	Influence	Habitat area	Source	Score	Trend
A04.02.02	Non-intensive sheep grazing	Medium	Negative	100%	Inside	-3.0	Imp
I01	Invasive non-native species	Low	Neutral	0.7%	Inside	0	Ins
K01.01	Erosion	High	Negative	11%	Inside	-1.5	Ins
	Overall score					-4.5	

Non-intensive sheep grazing (A04.02.02)

3.14 The Arroo Mountain cSAC Conservation Statement (NPWS, 2009) listed the maintenance of **4010 Wet heaths** at favourable conservation status as one of the main conservation objectives for the site. Douglas *et al.* (1990) rated the wet heaths on the plateau of Arroo Mountain cSAC very highly on a national basis, though it should be noted that a substantially smaller area of wet heaths was recorded during the present survey due to a different vegetation classification methodology. The CFP indicated that, by 1999, the condition of some areas of the site, particularly those close to the southern boundary, had deteriorated, exhibiting very severe damage and requiring destocking rates of over 10%. Following CFP reductions in stock numbers, key indicators tentatively suggest that vegetation structure is improving. The Arroo Mountain cSAC Site Synopsis (NPWS, 1999) described sheep grazing as the greatest threat to the site. Subsequently, the Arroo Mountain cSAC Conservation Statement (NPWS, 2009) described **4010 Wet heaths** as being in good condition, largely intact and undisturbed, and not heavily grazed for the most part.

3.15 The present survey indicates that sheep grazing is the dominant land use within Arroo Mountain cSAC and occurs throughout **4010 Wet heaths**. During the assessment of structure and functions, while levels of browsing were within acceptable limits, excessive levels of disturbance, due largely to trampling by sheep, were recorded at 60.0% of monitoring stops. The **4010 Wet heaths** monitoring stops that failed were located close to the southern boundary of the site (Fig. 6). These findings regarding the condition of **4010 Wet heaths** are consistent with those of the CFP but contrast with the information reported in the Conservation Statement. The intensity of this impact was assessed as medium overall and its influence as negative, but the trend was assessed as improving due to CFP reductions in stock numbers (Table 11).

Invasive non-native species (I01)

3.16 *Campylopus introflexus* is a non-native pioneer moss species of bare peat which can become abundant after disturbance such as peat cutting, burning or drainage (Atherton *et al*., 2010). Carpets of the moss have been found to have a significant depressive effect on germination of *Calluna vulgaris* seeds and therefore this species can impact on re-establishment of heather (Equiha & Usher, 1993; Bernth, 1998). Klinck (2010) defined it as a mild or temporary invasive species as it does not have long-term effects on biodiversity.

3.17 *Campylopus introflexus* was recorded within three **4010 Wet heaths** monitoring stops, with one of these failing due to excessive cover of this non-native species. The mean cover of *C. introflexus* within **4010 Wet heaths** monitoring stops was 0.7%. The degraded peat vegetation community DP1 *Campylopus introflexus – Polytrichum* spp. was recorded within 22 polygons dominated by **4010 Wet heaths** during vegetation mapping. However, it was not recorded as forming extensive carpets; therefore this impact was assessed as being of neutral influence.

Walking, horseriding and non-motorized vehicles (G01.02)

3.18 Recreational hillwalking occurs within the site. While there are no official, waymarked walking routes, walkers generally go from Aghanlish townland to the summit of Arroo (alt. 523 m), or do a circuit from Aghanlish to Arroo and the unnamed summits near Lough Aganny (alt. 482 m), Aghalateeve (alt. 432 m) and Keeloges (alt. 452 m). Arroo and Lough Aganny formed part of the route of the Ben Bulben Challenge (Goodman, 2011a, b), last held in 2004 (WAI, 2012). During the present survey, very low numbers of walkers were observed within the site. Furthermore, the Arroo Mountain cSAC Conservation Statement (NPWS, 2009) states that this activity has little impact on the site. The main walking routes cover areas containing relatively little **4010 Wet heath**. This impact has therefore not been deemed to be significant in **4010 Wet heaths** and has been omitted from Table 11.

Erosion (K01.01)

3.19 Erosion of **4010 Wet heaths** was noted at one monitoring stop during the assessment of structure and functions and in three polygons during vegetation mapping. Indeed, the Arroo Mountain cSAC Conservation Statement (NPWS, 2009) states that some areas of **4010 Wet heaths** have developed where ***7130/7130 Blanket bogs** have eroded away, leaving a thin covering of peat.

3.20 This impact may be linked to high levels of disturbance, due to trampling by sheep and, to a much lesser extent, hillwalkers, which are discussed in paragraphs 3.15 and 3.18 above. Due to destocking the number of sheep on this site has fallen in recent years. However, once exposed by removal of the vegetation, areas of bare peat may continue to erode due to climatic conditions regardless of manipulation of grazing levels; the mean annual rainfall for this area was within the range of 1400-1600 mm per year for 1981-2010 (Met Éireann, 2012). Therefore unless restoration measures are undertaken in badly eroded areas, erosion is likely to continue. It was assessed that there is insufficient data to determine the trend for this impact. Approximately 11% of the area of **4010 Wet heaths** is estimated to be under

threat from erosion; this is the proportion of the habitat occurring in polygons with at least 5% bare, shallow peat.

3.21 The overall impacts score for **4010 Wet heaths** has been calculated as -4.5. This is below the nominal Favourable Reference Value of zero. The combined future trend for area and structure and functions is however deemed to be improving due to the indications that the condition of this habitat is gradually improving due to CFP reductions in stock numbers (see paragraph 3.7). Significant impacts remain due to continuing erosion. The future prospects for this habitat were therefore assessed as Unfavourable – Inadequate.

4030 Dry heaths

Area

3.22 Changes in the area of **4030 Dry heaths** were recorded for the period 1995 to 2012 through a combination of observations in the field and analysis of aerial photographs and satellite imagery available through Google Earth (Table 12). Only losses in habitat were found, there were no gains in habitat area. These data are restricted to obvious changes in habitat; less obvious changes from one habitat type to another cannot be reliably identified by this process. Minor losses in area of **4030 Dry heaths** were recorded due to tracks (<0.01ha) and off-road motorized driving (<0.01ha). Erosion has resulted in loss of habitat, but due to the gradual and diffuse nature of this impact it was impractical to measure the area lost. Even when including the loss due to erosion it is estimated that the overall change in habitat area was a loss of less than 1% per year resulting in a status of Unfavourable – Inadequate. These impacts and trends are discussed later under future prospects.

Table 12: Impacts causing obvious losses in areas of 4030 Dry heaths, 1995-2012.
n.m. indicates not measured.

Impact code	Impact	Area (ha) 1995-2000	Area (ha) 2000-2005	Area (ha) 2005-2012	Area (ha) 1995-2012
D01.01	Paths, tracks, cycling tracks	<0.01	0.00	0.01	0.01
G01.03.02	Off-road motorized driving	0.00	0.00	<0.01	<0.01
K01.01	Erosion	n.m.	n.m.	n.m.	n.m.
All impacts		0.02	0.00	0.01	0.01
% of habitat		<0.01	0.00	<0.01	<0.01
% loss per year		<0.01	0.00	<0.01	<0.01

Structure and functions

3.23 Six monitoring stops were recorded in **4030 Dry heaths** within Arroo Mountain cSAC (Table 13). In the assessment of structure and functions, two monitoring stops failed one criterion

each. Following a review of the ecological condition of the stops that failed one criterion or more, expert judgement determined that no changes should be made, resulting in an overall failure rate of 33.3%. The structure and functions of **4030 Dry heaths** were therefore assessed as Unfavourable – Bad.

3.24 The vegetation composition of **4030 Dry heaths** monitoring stops was good, with no failures being recorded under the relevant criteria.

3.25 The vegetation structure of one **4030 Dry heaths** monitoring stop (16.7%) was poor, with inadequate structural diversity of *Calluna vulgaris* being recorded. Grazing levels were found to be within acceptable limits at all **4030 Dry heaths** monitoring stops.

3.26 The physical structure of one **4030 Dry heaths** monitoring stop (16.7%) was poor, with excessive levels of disturbed bare ground present in the local vicinity.

Future prospects

3.27 The impacts recorded for **4030 Dry heaths** are presented in Table 14. Six impacts were recorded for this habitat.

Non-intensive sheep grazing (A04.02.02)

3.28 The present survey indicates that sheep grazing is the dominant land use within Arroo Mountain cSAC and occurs throughout the **4030 Dry heaths**. During the assessment of structure and functions, levels of browsing were found to be within acceptable limits. Disturbed bare ground, due largely to trampling by sheep, was recorded at the majority of **4030 Dry heaths** monitoring stops, with one monitoring stop failing due to excessively high levels of disturbance. Conversely, an abundance of mature, "leggy" heather was noted at another monitoring stop. During vegetation mapping, overgrazing of **4030 Dry heaths** by sheep was recorded within three polygons. These findings indicate that levels of sheep grazing in **4030 Dry heaths** vary across the site. The intensity of this impact has been assessed as medium.

3.29 The Arroo Mountain cSAC Site Synopsis (NPWS, 1999) described sheep grazing as the greatest threat to the site. The CFP indicated that, by 1999, the condition of some areas of the site had deteriorated, exhibiting very severe damage and requiring destocking rates of over 10%. Following CFP reductions in stock numbers, key indicators tentatively suggest that vegetation structure is improving. The trend of this impact was assessed as improving due to CFP reductions in stock numbers.

Paths, tracks cycling tracks (D01.01)

3.30 There were some apparent losses of this habitat due to tracks.

Walking, horseriding and non-motorized vehicles (G01.02)

3.31 Recreational hillwalking occurs within the site. While there are no official, waymarked walking routes, walkers generally go from Aghanlish townland to the summit of Arroo (alt. 523 m), or do a circuit from Aghanlish to Arroo and the unnamed summits near Lough Aganny (alt. 482 m), Aghalateeve (alt. 432 m) and Keeloges (alt. 452 m). Arroo and Lough

Aganny formed part of the route of the Ben Bulben Challenge (Goodman, 2011a, b), last held in 2004 (WAI, 2012). During the present survey, very low numbers of walkers were observed within the site. The Arroo Mountain cSAC Conservation Statement (NPWS, 2009) states that

Table 13: Monitoring criteria and failure rates for 4030 Dry heaths (n = 6).

Criteria		Scale of assessment	Number of assessments	Number of failures	Failure rate (%)
Vegetation composition					
1	Number of bryophyte or non-crustose lichen species present, excluding *Campylopus* spp. and *Polytrichum* spp. ≥ 3	Relevé	6	0	0
2	Number of positive indicator species present ≥ 2	Relevé	6	0	0
3a	DH5 (Calcareous heaths): cover of positive indicator species 50-75%	Relevé	0	n/a	n/a
3b	Siliceous heaths: cover of positive indicator species ≥ 50%		6	0	0
4	Proportion of dwarf shrub cover composed of *Myrica gale, Salix repens, Ulex gallii* collectively < 50%	Relevé	6	0	0
5	Cover of the following weedy negative indicator species: *Cirsium arvense, C. vulgare, Ranunculus repens,* large *Rumex* species (except *R. acetosa*), *Senecio jacobea, Urtica dioica* collectively < 1%	Relevé	6	0	0
6	Cover of non-native species < 1%	Relevé	6	0	0
7	Cover of non-native species < 1%	Local vicinity	6	0	0
8	Cover of scattered native trees and scrub < 20%	Local vicinity	6	0	0
9	Cover of *Pteridium aquilinum* < 10%	Local vicinity	6	0	0
10	Cover of *Juncus effusus* < 10%	Local vicinity	6	0	0
Vegetation structure					
11	Senescent proportion of *Calluna vulgaris* cover < 50%	Relevé	6	0	0
12	Last complete growing season's shoots of ericoids and *Empetrum nigrum* showing signs of browsing collectively < 33%	Relevé	6	0	0
13	No signs of burning inside boundaries of sensitive areas*	Local vicinity	6	0	0
14	Outside boundaries of sensitive areas, all growth phases of *Calluna vulgaris* should occur throughout, with ≥ 10% of cover in mature phase	Local vicinity	6	1	16.7
Physical structure					
15	Cover of disturbed bare ground < 10%	Relevé	6	0	0
16	Cover of disturbed bare ground < 10%	Local vicinity	6	1	16.7

*Sensitive areas
(a) Areas where soils are thin and less than 5 cm deep.
(b) Hill slopes greater than 1 in 2 (26°), and all the sides of gullies.
(c) Ground with abundant, and/or an almost continuous carpet of *Sphagnum,* liverworts and/or lichens.
(d) Areas of H21 and H22 heath as defined by the NVC (Rodwell 1991). These are heaths primarily composed of mixtures of *Calluna vulgaris* and *Vaccinium myrtillus* over a moist carpet of bryophytes that often has a high *Sphagnum* content. Within the provisional classification, these communities are comparable to DH4 and damper elements of DH6 respectively.

(e) Areas with noticeably uneven structure, at a spatial scale of around 1 m² or less. The unevenness (e.g. more commonly found in very old heather stands) will relate to distinct, often large, spreading dwarf-shrub bushes. The dwarf-shrub canopy will not be completely continuous, and some of its upper surface may be twice as high as other parts. Layering is likely to be present and may be common.
(f) Pools, wet hollows, haggs and erosion gullies, and within 5 – 10 m of the edge of watercourses.

this activity has little impact on the site. The main walking routes cover areas containing **4030 Dry heaths**. Walking causes localised erosion and trampling. The intensity of this impact has been assessed as low and the influence as negative. The area of the habitat affected has been estimated to be less than 1%, due to the localised nature of this impact.

Off-road motorized driving (G01.03.02)

3.32 There were some apparent losses of this habitat due to off-road driving.

Invasive non-native species (I01)

3.33 *Campylopus introflexus* is a non-native pioneer moss species of bare peat which can become abundant after disturbance such as peat cutting, burning or drainage (Atherton *et al*., 2010). Carpets of the moss have been found to have a significant depressive effect on germination of *Calluna vulgaris* seeds and therefore this species can impact on re-establishment of heather (Equiha & Usher, 1993; Bernth, 1998). Klinck (2010) defined it as a mild or temporary invasive species as it does not have long-term effects on biodiversity.

3.34 *Campylopus introflexus* was recorded within one monitoring stop but was not sufficiently abundant to cause the stop to fail. The mean cover of *C. introflexus* within **4030 Dry heaths** monitoring stops was 0.02%. The degraded peat vegetation community DP1 *Campylopus introflexus – Polytrichum* spp. was recorded within 11 polygons dominated by **4030 Dry heaths** during vegetation mapping. However, it was not recorded as forming extensive carpets; therefore the impact of *Campylopus introflexus* was assessed as being of neutral influence.

3.35 *Rhododendron ponticum* was recorded within **4030 Dry heaths** at Leckanarainey. This non-native species is highly invasive, very difficult to eradicate completely and transforms the habitats in which it becomes established, making it detrimental to their conservation status. While this population is currently very small, *R. ponticum* can become established on **4030 Dry heaths**, transforming the character of the habitat, and, once established, it is very difficult to eliminate. The intensity of this impact was assessed as low overall and its influence as negative.

Erosion (K01.01)

3.36 Erosion of **4030 Dry heaths** (Plate 1) was noted within two polygons during vegetation mapping. This impact may be linked to high levels of disturbance, due largely to trampling by sheep, which are discussed in paragraph 3.28 above. Due to destocking the number of sheep on this site has fallen in recent years. However, once exposed by removal of the vegetation, areas of bare peat may continue to erode due to climatic conditions regardless of manipulation of grazing levels; the mean annual rainfall for this area was within the range of 1400-1600 mm per year for 1981-2010 (Met Éireann, 2012). Therefore unless restoration

measures are undertaken in badly eroded areas, erosion is likely to continue. It was assessed that there is insufficient data to determine the trend for this impact. Approximately 8% of the area of **4030 Dry heaths** is estimated to be under threat from erosion; this is the proportion of the habitat occurring in polygons with at least 5% bare, shallow peat.

Plate 1: Erosion at a 4030 Dry heaths monitoring stop at Aghalateeve (Photo: BEC Consultants)

Table 14: Assessment of impacts for 4030 Dry heaths. Under trend, Imp = Improving, Ins = Insufficient data.

Impact code	Impact	Intensity	Influence	Habitat area	Source	Score	Trend
A04.02.02	Non-intensive sheep grazing	Medium	Negative	100%	Inside	-3.0	Imp
D01.01	Paths, tracks, cycling tracks	High	Negative	<1%	Inside	-0.75	Ins
G01.02	Walking, horseriding and non-motorized vehicles	Low	Negative	<1%	Inside	-0.25	Ins
G01.03.02	Off-road motorized driving	High	Negative	<1%	Inside	-0.75	Ins
I01	Invasive non-native species	Low	Negative	0.02%	Inside	-0.25	Ins
K01.01	Erosion	High	Negative	8%	Inside	-1.5	Ins
	Overall score					-6.5	

3.37 The overall impacts score for **4030 Dry heaths** has been calculated as -6.5. This is below the nominal Favourable Reference Value of zero. The combined future trend for area and

structure and functions is deemed to be improving due to the indications that the condition of this habitat is gradually improving due to CFP reductions in stock numbers (see paragraph 3.7), though significant impacts, particularly from erosion, remain. The future prospects for this habitat were therefore assessed Unfavourable – Inadequate.

4060 Alpine and Boreal heaths

Area

3.38 Changes in the area of **4060 Alpine and Boreal heaths** were recorded for the period 1995 to 2012 through a combination of observations in the field and analysis of aerial photographs and satellite imagery available through Google Earth. These data are restricted to obvious changes in habitat; less obvious changes from one habitat type to another cannot be reliably identified by this process. No changes in area of habitat were noted; therefore the area status was assessed as Favourable.

Structure and functions

3.39 Four monitoring stops were recorded in **4060 Alpine and Boreal heaths** within Arroo Mountain cSAC (Table 15). In the assessment of structure and functions, these monitoring stops did not fail any criteria, resulting in an overall failure rate of 0%. The structure and functions of **4060 Alpine and Boreal heaths** were therefore assessed as Favourable.

Future prospects

3.40 Two impacts were recorded within **4060 Alpine and Boreal heaths** (Table 16).

Non-intensive sheep grazing (A04.02.02)

3.41 The present survey indicates that sheep grazing is the dominant land use within Arroo Mountain cSAC and occurs throughout **4060 Alpine and Boreal heaths**. During the assessment of structure and functions, levels of grazing and browsing were found to be within acceptable limits. Disturbed bare ground, due largely to trampling by sheep, was recorded at the majority of **4060 Alpine and Boreal heaths** monitoring stops, but its cover lay within acceptable limits. The intensity of this impact has been assessed as low and its influence as neutral.

Walking, horseriding and non-motorized vehicles (G01.02)

3.42 Recreational hillwalking occurs within the site. While there are no official, waymarked walking routes, walkers generally go from Aghanlish townland to the summit of Arroo (alt. 523 m), or do a circuit from Aghanlish to Arroo and the unnamed summits near Lough Aganny (alt. 482 m), Aghalateeve (alt. 432 m) and Keeloges (alt. 452 m). Arroo and Lough Aganny formed part of the route of the Ben Bulben Challenge (Goodman, 2011a, b), last held in 2004 (WAI, 2012). The main walking routes cover areas containing **4060 Alpine and Boreal heaths**. Walking causes localised erosion and trampling. During the present survey, very low numbers of walkers were observed within the site. the Arroo Mountain cSAC Conservation Statement (NPWS, 2009) states that this activity has little impact on the site.

The intensity of this impact has been assessed as low and the influence as negative. The area of the habitat affected has been estimated to be less than 1%, due to the localised nature of this impact.

Table 15: Monitoring criteria and failure rates for 4060 Alpine and Boreal heaths (*n* = 4).

Criteria		Scale of assessment	Number of assessments	Number of failures	Failure rate (%)
Vegetation composition					
1	Number of bryophyte or non-crustose lichen species present ≥ 3	Relevé	4	0	0
2	Cover of positive indicator species ≥ 66%	Relevé	4	0	0
3	Cover of dwarf shrubs ≥ 10%	Relevé	4	0	0
4	Cover of the following negative indicator species: *Agrostis capillaris, A. vinealis, Anthoxanthum odoratum, Deschampsia flexuosa, Festuca ovina, F. vivipara, Galium saxatile, Potentilla erecta* and *Poa* spp. (except *Poa alpina*) collectively < 10%	Relevé	4	0	0
5	Cover of non-native species < 1%	Relevé	4	0	0
Vegetation structure					
6	Live leaves of *Carex bigelowii, Deschampsia flexuosa, Festuca ovina, F. vivipara* showing signs of grazing collectively < 10%	Relevé	2	0	0
7	Last complete growing season's shoots of ericoids and *Empetrum nigrum* showing signs of browsing collectively < 33%	Relevé	4	0	0
8	No signs of burning inside feature	Local vicinity	4	0	0
Physical structure					
9	Cover of disturbed bare ground < 10%	Relevé	4	0	0
10	Cover of disturbed bare ground < 10%	Local vicinity	4	0	0

Table 16: Assessment of impacts for 4060 Alpine and Boreal heaths. Under trend, Imp = Ins = Insufficient data.

Impact code	Impact	Intensity	Influence	Habitat area	Source	Score	Trend
A04.02.02	Non-intensive sheep grazing	Low	Neutral	100%	Inside	0	Imp
G01.02	Walking, horseriding and non-motorized vehicles	Low	Negative	<1%	Inside	-0.25	Ins
	Overall score					-0.25	

3.43 The overall impacts score for **4060 Alpine and Boreal heaths** has been calculated as -0.25. This is marginally below the nominal Favourable Reference Value of zero. The combined future trend for area and structure and functions is deemed to be improving due to CFP

reductions in stock numbers. The future prospects for this habitat were therefore assessed as Favourable.

***7130/7130 Blanket bogs**

Area

3.44 Changes in the area of ***7130/7130 Blanket bogs** were recorded for the period 1995 to 2012 through a combination of observations in the field and analysis of aerial photographs and satellite imagery available through Google Earth (Table 17). Only losses in habitat were found, there were no gains in habitat area. These data are restricted to obvious changes in habitat; less obvious changes from one habitat type to another cannot be reliably identified by this process. The main measured loss in area of ***7130/7130 Blanket bogs** was due to peat extraction (combined area of 1.72 ha). Erosion has unquestionably resulted in loss of habitat, but due to the gradual and diffuse nature of this impact it was impractical to measure the area lost. Even when including the loss due to erosion it is estimated that the overall change in habitat area was a loss of less than 1% per year resulting in a status of Unfavourable – Inadequate. These impacts and trends are discussed later under future prospects. *Structure and functions*

Table 17: Impacts causing obvious losses in area of *7130/7130 Blanket bogs, 1995-2012.
n.m. indicates not measured.

Impact code	Impact	Area (ha) 1995-2000	Area (ha) 2000-2005	Area (ha) 2005-2012	Area (ha) 1995-2012
C01.03	Peat extraction	0.38	0.82	0.47	1.67
C01.03.02	Mechanical removal of peat	0.05	0.00	0.00	0.05
D01.01	Paths, tracks, cycling tracks	0.05	0.00	0.01	0.07
G01.03.02	Off-road motorized driving	0.00	0.00	0.02	0.02
J02.07	Water abstractions from groundwater	0.03	0.00	0.00	0.03
K01.01	Erosion	n.m.	n.m.	n.m.	n.m.
All impacts		0.51	0.82	0.50	1.83
% of habitat		0.02	0.04	0.02	0.08
% loss per year		<0.01	0.01	<0.01	<0.01

Structure and functions

3.45 A total of 11 monitoring stops were recorded in ***7130/7130 Blanket bogs** within Arroo Mountain cSAC (Table 18). All of these monitoring stops were located within ***7130 Active blanket bog** rather than **7130 Inactive blanket bog**. In the assessment of structure and

functions, four monitoring stops failed one criterion or more. Following a review of the ecological condition of the stops that failed one criterion or more, expert judgement determined that no changes should be made, resulting in an overall failure rate of 36.4%. The structure and functions of ***7130/7130 Blanket bogs** were therefore assessed as Unfavourable – Bad. Vegetation mapping indicated that the proportion of inactive, eroding and cutover bog within the total area of bog was 7.6%, which provides further support for the Unfavourable – Bad assessment result.

Table 18: Monitoring criteria and failure rates for *7130/7130 Blanket bogs (*n* = 11).

Criteria		Scale of assessment	Number of assessments	Number of failures	Failure rate (%)
Vegetation composition					
1	Number of positive indicator species present ≥ 7	Relevé	11	0	0
2	Cover of bryophyte or lichen species, excluding *Sphagnum fallax* ≥ 10%	Relevé	11	0	0
3	Cover of each of the following species: *Calluna vulgaris, Eleocharis multicaulis, Eriophorum vaginatum, Molinia caerulea, Schoenus nigricans, Trichophorum germanicum* individually < 75%	Relevé	11	1	9.1
4	Cover of the following negative indicator species: *Agrostis capillaris, Holcus lanatus, Phragmites australis, Pteridium aquilinum, Ranunculus repens* collectively < 1%	Relevé	11	0	0
5	Cover of non-native species < 1%	Relevé	11	0	0
6	Cover of non-native species < 1%	Local vicinity	11	0	0
7	Cover of scattered native trees and scrub < 10%	Local vicinity	11	0	0
Vegetation structure					
8	Crushed, broken and/or pulled up *Sphagnum* species < 10% of *Sphagnum* cover	Relevé	11	0	0
9	Last complete growing season's shoots of ericoids, *Empetrum nigrum* and *Myrica gale* showing signs of browsing collectively < 33%	Relevé	11	0	0
10	No signs of burning into the moss, liverwort or lichen layer or exposure of peat surface due to burning	Local vicinity	11	0	0
11	No signs of burning inside boundaries of sensitive areas*	Local vicinity	11	0	0
Physical structure					
12	Cover of disturbed bare ground < 10%	Relevé	11	0	0
13	Cover of disturbed bare ground < 10%	Local vicinity	11	1	9.1
14	Area showing signs of drainage resulting from heavy trampling or tracking or ditches or peat cutting < 10%	Local vicinity	11	2	18.2
15	Cover of erosion gullies and eroded areas within the greater bog mosaic < 5%	Local vicinity	11	1	9.1

*Sensitive areas

(a) Slopes greater than 1 in 3 (18°), and all the sides of gullies.

(b) Ground with abundant and/or an almost continuous carpet of *Sphagnum*, other mosses, liverworts and/or lichens.

(c) Patterned areas i.e. with pools, wet hollows, haggs and erosion gullies.

(d) Areas within 5-10 m of watercourses.
(e) Areas above 400 m in altitude.
(f) Areas within 50 m of functioning drains.

3.46 The vegetation composition of one ***7130/7130 Blanket bogs** monitoring stop (9.1%) was poor, with an excessive cover of *Calluna vulgaris.*

3.47 The vegetation structure of ***7130/7130 Blanket bogs** monitoring stops was good, with no failures being recorded under the relevant criteria. Grazing levels were found to be within acceptable limits at all ***7130/7130 Blanket bogs** monitoring stops.

3.48 The physical structure of ***7130/7130 Blanket bogs** was poor in some cases. One monitoring stop (9.1%) failed due to excessive cover of disturbed bare ground in the local vicinity and excessive levels of drainage, due to peat extraction. A second monitoring stop failed due to excessive levels of drainage, caused by trampling by sheep. One monitoring stop failed due to peat erosion in the local vicinity.

Future prospects

3.49 The impacts recorded for ***7130/7130 Blanket bogs** are presented in Table 19.

Table 19: Assessment of impacts for *7130/7130 Blanket bogs. Under trend, Imp = Improving, Ins = Insufficient data.

Impact code	Impact	Intensity	Influence	Habitat area	Source	Score	Trend
A04.02.02	Non-intensive sheep grazing	Medium	Negative	100%	Inside	-3.0	Imp
C01.03.01	Hand cutting of peat	High	Negative	<1%	Inside	-0.75	Ins
C01.03.02	Mechanical removal of peat	High	Negative	<1%	Inside	-0.75	Ins
D01.01	Paths, tracks, cycling tracks	High	Negative	<1%	Inside	-0.75	Ins
G01.02	Walking, horseriding and non-motorized vehicles	Low	Negative	<1%	Inside	-0.25	Ins
G01.03.02	Off-road motorised driving	Medium	Negative	<1%	Inside	-0.5	Ins
I01	Invasive non-native species	Low	Negative	0.1%	Inside	-0.25	Ins
J01.01	Burning down	High	Negative	<1%	Inside	-0.75	Ins
J02.07	Water abstractions from groundwater	High	Negative	<1%	Inside	-0.75	Ins
K01.01	Erosion	High	Negative	19.1%	Inside	-1.5	Ins
	Overall score					-9.25	

Non-intensive sheep grazing (A04.02.02)

3.50 The Arroo Mountain cSAC Conservation Statement (NPWS, 2009) listed the maintenance of ***7130/7130 Blanket bogs** at favourable conservation status as one of the main conservation objectives for the site. Douglas *et al.* (1990) rated the blanket bogs on the plateau of Arroo Mountain cSAC very highly on a national basis, due to their extent and intactness. It should be noted that a substantially larger area of blanket bogs was recorded during the present

survey due to a different vegetation classification methodology. The CFP indicated that, by 1999, the condition of some areas of the site had deteriorated, exhibiting very severe damage and requiring destocking rates of over 10%. Following CFP reductions in stock numbers, key indicators tentatively suggest that vegetation structure is improving. The Arroo Mountain cSAC Site Synopsis (NPWS, 1999) described sheep grazing as the greatest threat to the site. The Conservation Statement (NPWS, 2009) listed grazing as one of the main management issues on the site and stated that parts of the site remained heavily grazed at that time.

3.51 The present survey indicates that sheep grazing is the dominant land use within Arroo Mountain cSAC and occurs throughout ***7130/7130 Blanket bogs**. During the assessment of structure and functions, levels of grazing were found to be within acceptable limits. However, disturbed bare ground, due largely to trampling by sheep, was recorded at the majority of ***7130/7130 Blanket bogs** monitoring stops, with one monitoring stop failing due to excessively high levels of disturbance. During vegetation mapping, trampling, poaching and erosion due to overgrazing of ***7130/7130 Blanket bogs** by sheep was recorded within 15 polygons, which were located on the slopes to the south-east of Arroo (Fig. 4f) and in the townlands of Conwal South and Meenagraun. Due to the localised nature of this overgrazing (Plate 2), the intensity of this impact has been assessed as medium for the site as a whole. The trend of this impact was assessed as improving due to CFP reductions in stock numbers.

Peat extraction (C01.03)

3.52 The Arroo Mountain cSAC Site Synopsis (NPWS, 1999) stated that turf cutting was encroaching on the north and south-east sides of the site. Subsequently, the Arroo Mountain cSAC Conservation Statement (NPWS, 2009) identified turf cutting as one of the main management issues within the site. While cutover bog was found on all sides of the cSAC, active cutting was ongoing at four or five locations (including Largydonnell and Aghavoghil), situated close to the boundary of the site and easily accessed by trackways. Turf cutting activity within the site had declined in the years leading up to the publication of the Conservation Statement in 2009. The cutover areas were described as being small in extent, with the exception of a new area of cutover at Aghavoghil townland. During the present survey, active peat cutting was recorded at Aghavoghil, Gortnacrieve and near Largydonnell. Hand cutting and mechanical removal of peat are discussed separately below.

Hand cutting of peat (C01.03.01)

3.53 In old, abandoned cutovers, where peat was extracted by hand, there has been good regeneration of plant species. Although sausage machines are now the primary method of extraction, some cutting by hand for domestic purposes is ongoing (NPWS, 2009). During vegetation mapping in 2012, the present survey recorded active hand cutting of peat in ***7130/7130 Blanket bogs** near Largydonnell. In the assessment of structure and functions, a monitoring stop, located in ***7130/7130 Blanket bogs** adjacent to cutover bog near Largydonnell, failed due to excessive drainage. The area of the habitat affected has been estimated to be less than 1%, due to the localised nature of this impact.

Mechanical removal of peat (C01.03.02)

3.54 Sausage cutting is the primary method of peat extraction used within Arroo Mountain cSAC. It is thought to be for commercial use and produces tracts of bare peat. In the five years leading up to the publication of the Arroo Mountain cSAC Conservation Statement (NPWS, 2009), turf cutting using sausage machines took place on four sites within the cSAC. During vegetation mapping in 2012, active machine cutting was recorded in ***7130/7130 Blanket bogs** at Aghavoghil and Gortnacrieve. Severe damage due to past machine cutting, with removal of the bog surface, was recorded at Fallacarra on Crocknagapple. Approximately 0.2% of the total area of ***7130/7130 Blanket bogs** has been classified as **PB4 Cutover bog** (i.e. poorly vegetated cutover bog).

Paths, tracks, cycling tracks (D01.01)

3.55 There have been some minor losses of habitat due to extension of tracks in the area of Meenagraun and Gorteenachurry.

Walking, horseriding and non-motorized vehicles (G01.02)

3.56 Recreational hillwalking occurs within the site. While there are no official, waymarked walking routes, walkers generally go from Aghanlish townland onto the plateau and through an area of eroded ***7130/7130 Blanket bogs** to the summit of Arroo (alt. 523 m), or

Plate 2: Contrasting sheep grazing levels in *7130/7130 Blanket bogs on either side of a fence, south-east of Arroo (Photo: BEC Consultants)

do a circuit from Aghanlish to Arroo and the unnamed summits near Lough Aganny (alt. 482 m), Aghalateeve (alt. 432 m) and Keeloges (alt. 452 m). Arroo and Lough Aganny formed part of the route of the Ben Bulben Challenge (Goodman, 2011a, b), last held in 2004 (WAI, 2012). During the present survey, very low numbers of walkers were observed within the site.

3.57 The Arroo Mountain cSAC Conservation Statement (NPWS, 2009) states that this activity has little impact on the site. The main walking routes cover areas of ***7130/7130 Blanket bogs**. Walking causes localised erosion and trampling, with a "fairly well worn" track leading from the plateau to the summit of Arroo (Flanagan, 2006). The area of the habitat affected has been estimated to be less than 1%, due to the localised nature of this impact.

Off-road motorised driving (G01.03.02)

3.58 During vegetation mapping, vehicle tracks were recorded within ***7130/7130 Blanket bogs**. The surface of ***7130/7130 Blanket bogs** is vulnerable to damage from vehicles due to compaction or the vegetation being broken up (Hughes, 2008). Numerous car and tractor tracks, associated with turf cutting, were recorded at Gortnacrieve. These tracks caused damage to the vegetation and exposure and disturbance of peat. Quad bike tracks, associated with farming activity, were also recorded at Gortnacrieve, Kinkillew and Conwal South. However, the damage associated with these was minimal. The intensity of this impact has been assessed as medium overall and the area of the habitat affected has been estimated to be less than 1%, due to the localised nature of this impact.

Garbage and solid waste (H05.01)

3.59 Litter, consisting mainly of plastic bags, was recorded on ***7130/7130 Blanket bogs** near Largydonnell. The litter is associated with turf cutting activity. The effect of this localised impact on the conservation status ***7130/7130 Blanket bogs** is not thought to be significant and this impact has been omitted from Table 19.

Invasive non-native species (I01)

3.60 *Campylopus introflexus* is a non-native pioneer moss species of bare peat which can become abundant after disturbance such as peat cutting, burning or drainage (Atherton *et al*., 2010). Carpets of the moss have been found to have a significant depressive effect on germination of *Calluna vulgaris* seeds and therefore this species can impact on re-establishment of heather (Equiha & Usher, 1993; Bernth, 1998). Klinck (2010) defined it as a mild or temporary invasive species as it does not have long-term effects on biodiversity.

3.61 *Campylopus introflexus* was recorded within four monitoring stops but was not sufficiently abundant to cause any of the stops to fail. The mean cover of *C. introflexus* within ***7130/7130 Blanket bogs** monitoring stops was 0.1%. During vegetation mapping, the degraded peat vegetation community DP1 *Campylopus introflexus – Polytrichum* spp. was recorded within 145 polygons dominated by ***7130/7130 Blanket bogs** at covers of up to 10%. As extensive carpets of *C. introflexus* were recorded, the influence of this impact was assessed as negative.

Burning down (J01.01)

3.62 Although burning within ***7130/7130 Blanket bogs** was not recorded during the assessment of structure and functions, it was recorded in four polygons during vegetation mapping. These were located at Crocknagapple, Carrowrevagh, beside cutover bog at Cloghmeen and below the unnamed summit near Aghalateeve. Approximately 0.7% of the total area of ***7130/7130 Blanket bogs** has been burned in recent years, with some of these areas becoming badly degraded as a result.

Water abstractions from groundwater (J02.07)

3.63 There have been some minor losses of habitat due to extension of a drain in the upper Largydonnell area. Although the impact category does not accurately describe the impact in question it is the most appropriate option available on the list recommended by the EU for Habitats Directive Article 17 assessments (Ssymank, 2009).

Erosion (K01.01)

3.64 The Arroo Mountain cSAC Conservation Statement (NPWS, 2009) described the ***7130/7130 Blanket bogs** on the plateau as being very intact, with peat depths of up to 3 m. However, erosion was noted on the highest peaks, where bare peat and bedrock were exposed. Goodman (2011b) described an eroded area of peat haggs below the summit ridge of Arroo. During the assessment of structure and functions, erosion of ***7130/7130 Blanket bogs** was recorded at 45.5% of monitoring stops, with one stop failing due to excessive erosion.

3.65 This impact may be linked to high levels of disturbance, due largely to trampling by sheep, which are discussed in paragraph 3.51 above. Due to destocking the number of sheep on this site has fallen in recent years. However, once exposed by removal of the vegetation, areas of bare peat may continue to erode due to climatic conditions regardless of manipulation of grazing levels; the mean annual rainfall for this area was within the range of 1400-1600 mm per year for 1981-2010 (Met Éireann, 2012). Therefore unless restoration measures are undertaken in badly eroded areas, erosion is likely to continue. It was assessed that there is insufficient data to determine the trend for this impact. Approximately 19.1% of the area of ***7130/7130 Blanket bogs** is estimated to be under threat from erosion; this is the proportion of the habitat occurring in polygons with at least 5% bare blanket peat.

3.66 The overall impacts score for ***7130/7130 Blanket bogs** has been calculated as -9.25. This is significantly below the nominal Favourable Reference Value of zero. Whilst CFP reductions in stock numbers have resulted in reduced grazing levels within this habitat (see paragraph 3.7), it is not thought this will result in a significant change in the conservation status of the habitat overall within the next twelve years due to continued erosion in the absence of restoration measures. The combined future trend for area and structure and functions was therefore assessed as no change. The future prospects for this habitat were therefore assessed as Unfavourable – Bad.

7140 Transition mires

Area

3.67 Changes in the area of **7140 Transition mires** were recorded for the period 1995 to 2012 through a combination of observations in the field and analysis of aerial photographs and satellite imagery available through Google Earth. These data are restricted to obvious changes in habitat; less obvious changes from one habitat type to another cannot be reliably identified by this process. No changes in area of habitat were noted; therefore the area status was assessed as Favourable.

Structure and functions

3.68 One monitoring stop was recorded in **7140 Transition mires** within Arroo Mountain cSAC (Table 20). In the assessment of structure and functions, this monitoring stop did not fail any criteria, resulting in an overall failure rate of 0%. The structure and functions of **7140 Transition mires** were therefore assessed as Favourable.

3.69 The small sample size of one monitoring stop reflects the relative rarity of this habitat within the site, where only 4.6 ha of **7140 Transition mires** were recorded, comprising 0.1% of the site.

Table 20: Monitoring criteria and failure rates for 7140 Transition mires (n = 1).

Criteria		Scale of assessment	Number of assessments	Number of failures	Failure rate (%)
Vegetation composition					
1a	PO1a: number of positive indicator species from Groups i or ii present ≥ 3	Relevé	0	n/a	n/a
1b	PFLU5: number of positive indicator species from Groups i or ii present ≥ 3		1	0	0
1c	RFEN1b: number of positive indicator species from Groups i or ii present ≥ 6		0	n/a	n/a
2	Number of species from Group i present ≥ 1	Relevé	1	0	0
3	Cover of the following species: small to medium sized *Carex* spp., *Equisetum fluviatile*, *Hydrocotyle vulgaris*, *Hypericum elodes*, *Mentha aquatica*, *Menyanthes trifoliata*, *Potentilla palustris*, *Sphagnum* spp. collectively ≥ 25%	Relevé	1	0	0
4	Cover of the following species: *Anthoxanthum odoratum*, *Epilobium hirsutum*, *Holcus lanatus* collectively < 1%	Relevé	1	0	0
5	Cover of non-native species < 1%	Relevé	1	0	0
Vegetation structure					
6	PFLU5/RFEN1b: ≥ 50% of the tips of live leaves and/or flowering shoots of vascular plants should be more than 15 cm above the ground surface	Relevé	1	0	0
Physical structure					
7	Cover of disturbed bare ground < 10%	Relevé	1	0	0
8	Cover of disturbed bare ground < 10%	Local vicinity	1	0	0
9	Area showing signs of drainage resulting from heavy trampling or tracking or ditches < 10%	Local vicinity	1	0	0

Future prospects

3.70 No impacts (Threats, Pressures and Activities code X) were recorded within **7140 Transition mires**. The overall impacts score for **7140 Transition mires** was therefore calculated as zero, which equals the nominal Favourable Reference Value. The combined future trend for area and structure and functions is deemed to be no change. The future prospects for this habitat were therefore assessed as Favourable.

7150 *Rhynchosporion* depressions

Area

3.71 Changes in the area of **7150 *Rhynchosporion* depressions** were recorded for the period 1995 to 2012 through a combination of observations in the field and analysis of aerial photographs and satellite imagery available through Google Earth. These data are restricted to obvious changes in habitat; less obvious changes from one habitat type to another cannot be reliably identified by this process. No changes in area of habitat were noted; therefore the area status was assessed as Favourable.

Structure and functions

3.72 One monitoring stop was recorded in **7150 *Rhynchosporion* depressions** within Arroo Mountain cSAC (Table 21). In the assessment of structure and functions, this monitoring stop failed two criteria. Following a review of the ecological condition of this stop, expert judgement determined that no changes should be made, resulting in an overall failure rate of 100.0%. The structure and functions of **7150 *Rhynchosporion* depressions** were therefore assessed as Unfavourable - Bad.

3.73 The vegetation composition and vegetation structure of the **7150 *Rhynchosporion* depressions** monitoring stop were good. However, the physical structure was poor, with excessive cover of disturbed bare ground being recorded both within and in the local vicinity of the monitoring stop. This is likely to be due to trampling by sheep.

3.74 The small sample size of one monitoring stop reflects the relative rarity of this habitat within the site, where only 4.1 ha of **7150 *Rhynchosporion* depressions** were recorded, comprising 0.1% of the site.

Future prospects

3.75 Two impacts were recorded within **7150 *Rhynchosporion* depressions** (Table 22).

<u>Non-intensive sheep grazing (A04.02.02)</u>

3.76 The present survey indicates that sheep grazing is the dominant land use within Arroo Mountain cSAC and occurs throughout **7150 *Rhynchosporion* depressions**. During the assessment of structure and functions, sheep grazing was recorded within the **7150 *Rhynchosporion* depressions** monitoring stop, with 10% of the previous year's ericoid shoots showing signs of browsing. While this level of grazing was not excessive, the

monitoring stop failed due to excessive cover of disturbed bare ground within and in the vicinity of the monitoring stop. This disturbance is likely to be due to trampling by sheep.

3.77 The Arroo Mountain cSAC Site Synopsis (NPWS, 1999) described sheep grazing as the greatest threat to the site, while the Arroo Mountain cSAC Conservation Statement (NPWS, 2009) listed grazing as one of the main management issues on the site. The CFP indicated that, by 1999, the condition of some areas of the site had deteriorated, exhibiting very severe damage and requiring destocking rates of over 10%. The trend of this impact was assessed as improving due to CFP reductions in stock numbers.

Table 21: Monitoring criteria and failure rates for 7150 *Rhynchosporion* depressions (n = 1).

Criteria		Scale of assessment	Number of assessments	Number of failures	Failure rate (%)
Vegetation composition					
1	Number of positive indicator species present ≥ 5	Relevé	1	0	0
2	Cover of *Rhynchospora* spp. ≥ 10%	Relevé	1	0	0
3	Cover of each of the following species: *Eleocharis multicaulis*, *Molinia caerulea, Schoenus nigricans, Trichophorum germanicum* individually < 35%	Relevé	1	0	0
4	Cover of the following negative indicator species: *Agrostis capillaris, Holcus lanatus, Phragmites australis, Pteridium aquilinum, Ranunculus repens* collectively < 1%	Relevé	1	0	0
5	Cover of non-native species < 1%	Relevé	1	0	0
6	Cover of scattered native trees and scrub < 10%	Local vicinity	1	0	0
Vegetation structure					
7	Crushed, broken and/or pulled up *Sphagnum* species < 10% of *Sphagnum* cover	Relevé	1	0	0
8	Last complete growing season's shoots of ericoids, *Empetrum nigrum* and *Myrica gale* shrubs showing signs of browsing collectively < 33%	Relevé	1	0	0
9	No signs of burning into the moss, liverwort or lichen layer or exposure of peat surface due to burning	Local vicinity	1	0	0
10	No signs of burning inside boundaries of sensitive areas*	Local vicinity	1	0	0
Physical structure					
11	Cover of disturbed bare ground < 10%	Relevé	1	1	100.0
12	Cover of disturbed bare ground < 10%	Local vicinity	1	1	100.0
13	Area showing signs of drainage resulting from heavy trampling or tracking or ditches < 10%	Local vicinity	1	0	0
14	Cover of erosion gullies and eroded areas within the greater bog mosaic < 5%	Local vicinity	1	0	0

*Sensitive areas

(a) Ground with abundant and/or an almost continuous carpet of *Sphagnum.*

(b) Patterned areas (i.e. with pools and wet hollows).

(c) Areas within 50 m of functioning drains.

(d) Areas within 5-10 m of watercourses.

Invasive non-native species (I01)

3.78 *Campylopus introflexus* is a non-native pioneer moss species of bare peat which can become abundant after disturbance (Atherton *et al*., 2010). Carpets of the moss have been found to have a significant depressive effect on germination of *Calluna vulgaris* seeds and therefore this species can impact on re-establishment of heather (Equiha & Usher, 1993; Bernth, 1998). Klinck (2010) defined it as a mild or temporary invasive species as it does not have long-term effects on biodiversity.

Table 22: Assessment of impacts for 7150 *Rhynchosporion* depressions. Under trend, Imp = Improving, Ins = Insufficient data.

Impact code	Impact	Intensity	Influence	Habitat area	Source	Score	Trend
A04.02.02	Non-intensive sheep grazing	Medium	Negative	100%	Inside	-3.0	Imp
I01	Invasive non-native species	Low	Neutral	0.5%	Inside	0	Ins
	Overall score					-3.0	

3.79 *Campylopus introflexus* was recorded within the **7150 *Rhynchosporion* depressions** monitoring stop at a cover of 0.5%, but was not sufficiently abundant to cause the stop to fail. The colonisation of this area of **7150 *Rhynchosporion* depressions** by *C. introflexus* may have been facilitated by disturbance due to trampling by sheep. *C. introflexus* was not recorded as forming extensive carpets within this habitat; therefore this impact was assessed as being of neutral influence.

3.80 The overall impacts score for **7150 *Rhynchosporion* depressions** has been calculated as -3.0. This is below the nominal Favourable Reference Value of zero. The combined future trend for area and structure and functions is deemed to be improving due to CFP reductions in stock numbers. The future prospects for this habitat were therefore assessed as Favourable.

7230 Alkaline fens

Area

3.81 Changes in the area of **7230 Alkaline fens** were recorded for the period 1995 to 2012 through a combination of observations in the field and analysis of aerial photographs and satellite imagery available through Google Earth. These data are restricted to obvious changes in habitat; less obvious changes from one habitat type to another cannot be reliably identified by this process. No changes in area of habitat were noted; therefore the area status was assessed as Favourable.

Structure and functions

3.82 Two monitoring stops were recorded in **7230 Alkaline fens** within Arroo Mountain cSAC (Table 23). In the assessment of structure and functions, one monitoring stop failed one criterion relating to vegetation composition. Criterion 5 stipulates that the cover of non-native species should be less than 1%; a cover of 1% *Epilobium brunnescens* was recorded at

that stop. Following a review of the ecological condition of that monitoring stop, expert judgement determined that the stop should pass because the failure was very marginal. As a result, all stops passed and the structure and functions of **7230 Alkaline fens** were therefore assessed as Favourable.

Future prospects

3.83 Two impacts were recorded within **7230 Alkaline fens** (Table 24).

Non-intensive sheep grazing (A04.02.02)

3.84 The present survey indicates that sheep grazing is the dominant land use within Arroo Mountain cSAC and occurs within **7230 Alkaline fens**. During the assessment of structure and functions, disturbed bare ground was recorded within, and in the vicinity of, one of two **7230 Alkaline fens** monitoring stops. However, the level of disturbance was not sufficiently high to cause the monitoring stop to fail. This disturbance is likely to be due to trampling by sheep.

Table 23: Monitoring criteria and failure rates for 7230 Alkaline fens (*n* = 2).

Criteria		Scale of assessment	Number of assessments	Number of failures	Failure rate (%)
Vegetation composition					
1	At least one brown moss species present	Relevé	2	0	0
2a	RFLU1a/RFLU2: number of positive vascular indicator species present ≥ 2	Relevé	2	0	0
2b	RFLU4/RFEN1a: number of positive vascular indicator species present ≥ 3		0	n/a	n/a
3a	RFLU1a/RFLU2: vegetation cover of brown mosses and vascular indicator species ≥ 20%	Relevé	2	0	0
3b	RFLU4/RFEN1a: vegetation cover of brown mosses and vascular indicator species ≥ 75%		0	n/a	n/a
4	Total cover of the following species: *Anthoxanthum odoratum, Epilobium hirsutum, Holcus lanatus, Ranunculus repens* < 1%	Relevé	2	0	0
5	Cover of non-native species < 1%	Relevé	2	1	50.0
6	Cover of scattered native trees and scrub < 10%	Local vicinity	2	0	0
7	Total cover of *Juncus effusus* and *Phragmites australis* < 10%	Local vicinity	2	0	0
Vegetation structure					
8	At least 50% of the live leaves/flowering shoots are more than 5 cm above ground surface	Relevé	2	0	0
Physical structure					
9	Cover of disturbed, bare ground < 10%	Relevé	2	0	0
10	Cover of disturbed, bare ground < 10%	Local vicinity	2	0	0
11	Area showing signs of drainage resulting from ditches or heavy trampling or tracking < 10%	Local vicinity	2	0	0
12	Where tufa is present, disturbed proportion of vegetation cover < 1%	Local vicinity	0	n/a	n/a

Table 24: Assessment of impacts for 7230 Alkaline fens. Under trend, Imp = Improving, Ins = Insufficient data.

Impact code	Impact	Intensity	Influence	Habitat area	Source	Score	Trend
A04.02.02	Non-intensive sheep grazing	Medium	Negative	50%	Inside	-1.5	Imp
I01	Invasive non-native species	Low	Negative	0.75%	Inside	-0.25	Ins
	Overall score					-1.75	

3.85 The Arroo Mountain cSAC Site Synopsis (NPWS, 1999) described sheep grazing as the greatest threat to the site, while the Arroo Mountain cSAC Conservation Statement (NPWS, 2009) listed grazing as one of the main management issues on the site. The CFP indicated that, by 1999, the condition of some areas of the site had deteriorated, exhibiting very severe damage and requiring destocking rates of over 10%. The trend of this impact was assessed as improving due to CFP reductions in stock numbers.

Invasive non-native species (I01)

3.86 *Epilobium brunnescens* is a species of damp, stony places, especially in the mountains, which is localised but spreading in Ireland (Parnell & Curtis, 2012). During the present survey, *E. brunnescens* was recorded within both **7230 Alkaline fens** monitoring stops, giving it a frequency of 100.0% within this habitat at this site, with cover scores of 0.5% and 1%.

3.87 The intensity of this impact is assessed as low, since this species does not tend to transform the nature of the habitats in which it becomes established but, nonetheless, its influence has been assessed as negative (Table 24). The area affected has been estimated to be 0.75%, based on the average cover of *Epilobium brunnescens* within **7230 Alkaline fens** relevés.

3.88 The overall impacts score for **7230 Alkaline fens** has been calculated as -1.75. This is below the nominal Favourable Reference Value of zero. The combined future trend for area and structure and functions is deemed to be improving due to CFP reductions in stock numbers. The future prospects for this habitat were therefore assessed as Favourable.

8110 Siliceous scree

Area

3.89 Changes in the area of **8110 Siliceous scree** were recorded for the period 1995 to 2012 through a combination of observations in the field and analysis of aerial photographs and satellite imagery available through Google Earth. These data are restricted to obvious changes in habitat; less obvious changes from one habitat type to another cannot be reliably identified by this process. No changes in area of habitat were noted; therefore the area status was assessed as Favourable.

Structure and functions

3.90 One monitoring stop was recorded in **8110 Siliceous scree** within Arroo Mountain cSAC (Table 25). In the assessment of structure and functions, this monitoring stop did not fail

any criteria, resulting in an overall failure rate of 0%. The structure and functions of **8110 Siliceous scree** were therefore assessed as Favourable.

3.91 The small sample size of one monitoring stop reflects the relative rarity of this habitat within the site, where only 0.6 ha of **8110 Siliceous scree** were recorded, comprising 0.02% of the site.

Future prospects

3.92 No impacts (Threats, Pressures and Activities code X) were recorded within **8110 Siliceous scree**. The overall impacts score for **8110 Siliceous scree** was therefore calculated as zero, which equals the nominal Favourable Reference Value. The combined future trend for area and structure and functions is deemed to be no change. The future prospects for this habitat were therefore assessed as Favourable.

Table 25: Monitoring criteria and failure rates for 8110 Siliceous scree (n = 1).

Criteria		Scale of assessment	Number of assessments	Number of failures	Failure rate (%)
Vegetation composition					
1	Cover of bryophyte and non-crustose lichen species ≥ 5%	Relevé	1	0	0
2	Proportion of vegetation composed of following negative indicator species: *Cirsium arvense, C. vulgare, Rubus fruticosus* agg., large *Rumex* species (except *R. acetosa*), *Senecio jacobaea, Urtica dioica* collectively < 1%	Relevé	1	0	0
3	Proportion of vegetation composed of non-native species < 1%	Relevé	1	0	0
4	Block scree: number of positive indicator species for 8220 present ≥ 1	Local vicinity	1	0	0
5	Cover of grass species and dwarf shrubs collectively < 20%	Local vicinity	1	0	0
6	Cover of *Pteridium aquilinum*, native trees and scrub collectively < 25%	Local vicinity	1	0	0
Vegetation structure					
7	Live leaves of forbs and shoots of dwarf shrubs showing signs of grazing or browsing collectively < 50%	Relevé	1	0	0
Physical structure					
8	Ground disturbed by human & animal paths, scree running, vehicles < 10%	Relevé	1	0	0
9	Ground disturbed by human & animal paths, scree running, vehicles < 10%	Local vicinity	1	0	0

8120 Calcareous scree

Area

3.93 Changes in the area of **8120 Calcareous scree** were recorded for the period 1995 to 2012 through a combination of observations in the field and analysis of aerial photographs and satellite imagery available through Google Earth. These data are restricted to obvious

changes in habitat; less obvious changes from one habitat type to another cannot be reliably identified by this process. No changes in area of habitat were noted; therefore the area status was assessed as Favourable.

Structure and functions

3.94 Three monitoring stops were recorded in **8120 Calcareous scree** within Arroo Mountain cSAC (Table 26). In the assessment of structure and functions, two monitoring stops failed multiple criteria. Following a review of the ecological condition of the stops that failed one criterion or more, expert judgement determined that no changes should be made, resulting in an overall failure rate of 66.7%. The structure and functions of **8120 Calcareous scree** were therefore assessed as Unfavourable – Bad.

Table 26: Monitoring criteria and failure rates for 8120 Calcareous scree (*n* = 3).

Criteria		Scale of assessment	Number of assessments	Number of failures	Failure rate (%)
Vegetation composition					
1	Number of indicative fern or *Saxifraga* species present ≥ 1	Local vicinity	3	2	66.7
2	Total number of positive indicator species present ≥ 2	Local vicinity	3	2	66.7
3	Cover of dwarf shrubs and grass species, excluding *Sesleria caerulea* collectively < 20%	Relevé	3	0	0
4	Proportion of vegetation composed of following negative indicator species: *Cirsium arvense, C. vulgare, Pteridium aquilinum, Rubus fruticosus* agg., large *Rumex* species (except *R. acetosa*), *Senecio jacobaea, Urtica dioica* collectively < 1%	Relevé	3	2	66.7
5	Proportion of vegetation composed of non-native species < 1%	Relevé	3	0	0
6	Cover of *Pteridium aquilinum*, native trees and scrub collectively < 25%	Local vicinity	3	0	0
Vegetation structure					
6	Live leaves of forbs and shoots of dwarf shrubs showing signs of grazing or browsing collectively < 50%	Relevé	3	0	0
Physical structure					
7	Ground disturbed by human & animal paths, scree running, vehicles < 10%	Relevé	3	1	33.3
8	Ground disturbed by human & animal paths, scree running, vehicles < 10%	Local vicinity	3	2	66.7

3.95 The vegetation composition of most **8120 Calcareous scree** monitoring stops was poor, with 66.7% exhibiting an inadequate number of positive indicator species and excessive cover of the negative indicator species *Urtica dioica.* The poorly developed vegetation may be due to the loose, mobile nature of the scree.

3.96 The vegetation structure of **8120 Calcareous scree** monitoring stops was found to be good, with no failures being recorded under the relevant criterion.

3.97 The physical structure of most **8120 Calcareous scree** monitoring stops was poor, with excessive levels of disturbance being recorded within 33.3% of monitoring stops and in the local vicinity of 66.7% of monitoring stops. This may be attributed to the presence of numerous sheep tracks.

Future prospects

3.98 The only significant impact recorded within **8120 Calcareous scree** (Table 27) was sheep grazing.

Non-intensive sheep grazing (A04.02.02)

3.99 The Arroo Mountain cSAC Conservation Statement (NPWS, 2009) listed the maintenance of **8120 Calcareous scree** at favourable conservation status as one of the main conservation objectives for the site.

3.100 The present survey indicates that sheep grazing is the dominant land use within Arroo Mountain cSAC and occurs within **8120 Calcareous scree**. During the assessment of structure and functions, sheep grazing was recorded within one of three **8120 Calcareous scree** monitoring stops. The level of grazing was not sufficiently high to cause the monitoring stop to fail. However, numerous sheep paths were observed in the vicinity of two monitoring stops, resulting in excessive cover of disturbed ground and causing the monitoring stops to fail. Both of the monitoring stops that failed were composed of loose, mobile scree with a relatively small clast size, which appears to be more accessible to sheep than stable, block scree.

3.101 The Arroo Mountain cSAC Site Synopsis (NPWS, 1999) described sheep grazing as the greatest threat to the site, while the Arroo Mountain cSAC Conservation Statement (NPWS, 2009) listed grazing as one of the main management issues on the site. The CFP indicated that, by 1999, the condition of some areas of the site had deteriorated, exhibiting very severe damage and requiring destocking rates of over 10%. The trend of this impact was assessed as improving due to CFP reductions in stock numbers.

3.102 The overall impacts score for **8120 Calcareous scree** has been calculated as -1.0. This is below the nominal Favourable Reference Value of zero. The combined future trend for area and structure and functions is deemed to be improving due to CFP reductions in stock numbers. The future prospects for this habitat were therefore assessed as Favourable.

Table 27: Assessment of impacts for 8120 Calcareous scree. Under trend, Imp = Improving.

Impact code	Impact	Intensity	Influence	Habitat area	Source	Score	Trend
A04.02.02	Non-intensive sheep grazing	Low	Negative	66.7%	Inside	-1.0	Imp
	Overall score					-1.0	

8210 Calcareous rocky slopes

Area

3.103 Changes in the area of **8210 Calcareous rocky slope** were recorded for the period 1995 to 2012 through a combination of observations in the field and analysis of aerial photographs and satellite imagery available through Google Earth. These data are restricted to obvious changes in habitat; less obvious changes from one habitat type to another cannot be reliably identified by this process. No changes in area of habitat were noted; therefore the area status was assessed as Favourable.

Structure and functions

3.104 Four monitoring stops were recorded in **8210 Calcareous rocky slopes** within Arroo Mountain cSAC (Table 28). In the assessment of structure and functions, two monitoring stops failed one criterion. Following a review of the ecological condition of the stops that failed one criterion or more, expert judgement determined that no changes should be made, resulting in an overall failure rate of 50.0%. The structure and functions of **8210 Calcareous rocky slopes** were therefore assessed as Unfavourable – Bad.

3.105 The vegetation composition of 50.0% of **8210 Calcareous rocky slopes** monitoring stops was poor, with two stops failing due to excessive cover of the non-native *Epilobium brunnescens*. The vegetation structure of **8210 Calcareous rocky slopes** monitoring stops was good, with no failures being recorded under the relevant criterion.

Table 28: Monitoring criteria and failure rates for 8210 Calcareous rocky slopes (n = 4).

Criteria		Scale of assessment	Number of assessments	Number of failures	Failure rate (%)
Vegetation composition					
1	Number of indicative fern or *Saxifraga* species present ≥ 1	Local vicinity	4	0	0
2	Total number of positive indicator species present ≥ 3	Local vicinity	4	0	0
3	Proportion of vegetation composed of non-native species < 1%	Local vicinity	4	2	50.0
4	Cover of *Pteridium aquilinum*, native trees and scrub collectively < 25%	Local vicinity	4	0	0
Vegetation structure					
5	Live leaves of forbs and shoots of dwarf shrubs showing signs of grazing or browsing collectively < 50%	Local vicinity	4	0	0

Future prospects

3.106 Two impacts were recorded within **8210 Calcareous rocky slopes** (Table 29).

3.107 The Arroo Mountain cSAC Conservation Statement (NPWS, 2009) listed the maintenance of **8210 Calcareous rocky slopes** at favourable conservation status as one of the main conservation objectives for the site.

Non-intensive sheep grazing (A04.02.02)

3.108 The present survey indicates that sheep grazing does occur within **8210 Calcareous rocky slopes**. During the assessment of structure and functions, sheep grazing was recorded within two of four **8120 Calcareous scree** monitoring stops, although the level of grazing was not sufficiently high to cause either monitoring stop to fail. The intensity of this impact was assessed as low overall and its influence as neutral.

3.109 The Arroo Mountain cSAC Site Synopsis (NPWS, 1999) described sheep grazing as the greatest threat to the site, while the Arroo Mountain cSAC Conservation Statement (NPWS, 2009) listed grazing as one of the main management issues on the site. The CFP indicated that, by 1999, the condition of some areas of the site had deteriorated, exhibiting very severe damage and requiring destocking rates of over 10%. The trend of this impact was assessed as improving due to CFP reductions in stock numbers.

Table 29: Assessment of impacts for 8210 Calcareous rocky slopes. Under trend, Imp = Improving, Ins = Insufficient data.

Impact code	Impact	Intensity	Influence	Habitat area	Source	Score	Trend
A04.02.02	Non-intensive sheep grazing	Low	Neutral	50%	Inside	0	Imp
I01	Invasive non-native species	Low	Negative	2%	Inside	-0.5	Ins
	Overall score					-0.5	

Collection (F04.02)

3.110 Goodwillie (1978) highlighted the conservation value of the cliff habitats on Arroo Mountain, overlooking Lough Melvin, and recommended their designation as a protected area. It was suggested that designation would provide an important example of the preservation of a vulnerable but neglected habitat and reduce the threat of unscrupulous collection of rare arctic-alpine plant species. This impact was not recorded during the present survey and there are no records of recent activity of this nature, therefore the impact is omitted from the assessment of future prospects and from Table 29.

Invasive non-native species (I01)

3.111 *Epilobium brunnescens* is a species of damp, stony places, especially in the mountains, which is localised but spreading in Ireland (Parnell & Curtis, 2012). During the present survey, *E. brunnescens* was recorded within two **8210 Calcareous rocky slopes** monitoring stops, giving it a frequency of 50.0% within this habitat at this site, with cover scores of 1% and 7%. These two monitoring stops failed due to excessive cover of this species (50.0%).

3.112 Hughes (2008) identified *Epilobium brunnescens* as a threat to **8210 Calcareous rocky slopes** in the Eryri SAC in Snowdonia, Wales, with the species being present in much of this habitat within that site.

3.113 The intensity of this impact on **8210 Calcareous rocky slopes** within the Arroo Mountain cSAC is assessed as low, since this species does not tend to transform the nature of the habitats in which it becomes established but, nonetheless, its influence has been assessed as

negative (Table 29). The area affected has been estimated to be 2.0%, based on the average cover of *Epilobium brunnescens* within **8210 Calcareous rocky slopes** relevés.

3.114 The overall impacts score for **8210 Calcareous rocky slopes** has been calculated as -0.5. This is below the nominal Favourable Reference Value of zero. The combined future trend for area and structure and functions is deemed to be improving due to CFP reductions in stock numbers but the negative influence of invasive no-native species remains. The future prospects for this habitat were however assessed as Favourable.

Summary of conservation assessment

3.115 The summary results for the conservation assessment of Annex I habitats in Arroo Mountain cSAC are presented in Table 30. Of the ten habitats assessed, four were assessed as Favourable and six as Unfavourable – Bad.

Table 30: Summary of conservation status assessments for Annex I habitats in Arroo Mountain cSAC.

Annex I code	Habitat	Area	Structure and functions	Future prospects	Overall assessment
4010	Wet heaths	Unfavourable - Inadequate	Unfavourable - Bad	Unfavourable - Inadequate	Unfavourable – Bad
4030	Dry heaths	Unfavourable - Inadequate	Unfavourable - Bad	Unfavourable - Inadequate	Unfavourable – Bad
4060	Alpine and Boreal heaths	Favourable	Favourable	Favourable	Favourable
*7130/7130	Blanket bogs	Unfavourable - Inadequate	Unfavourable - Bad	Unfavourable - Bad	Unfavourable – Bad
7140	Transition mires	Favourable	Favourable	Favourable	Favourable
7150	*Rhynchosporion* depressions	Favourable	Unfavourable - Bad	Favourable	Unfavourable – Bad
7230	Alkaline fens	Favourable	Favourable	Favourable	Favourable
8110	Siliceous scree	Favourable	Favourable	Favourable	Favourable
8120	Calcareous scree	Favourable	Unfavourable - Bad	Unfavourable - Inadequate	Unfavourable – Bad
8210	Calcareous rocky slopes	Favourable	Unfavourable - Bad	Favourable	Unfavourable - Bad

3.116 Generally, habitats performed well in the area assessments with no major losses of habitat being readily apparent though the widespread peat habitats have performed poorly for this element of the assessment. These widespread habitats have also performed poorly for the structure and functions assessment though some of the rocky habitats have also performed

badly for this. Habitats tended to perform better under future prospects than under structure and function as it is predicted that habitats will gradually recover from previous high stocking levels.

4. DISCUSSION

Natura 2000 Standard Data Form

4.1 Thirteen Annex I habitats were recorded in the cSAC that are currently not listed for the site on the Natura 2000 Standard Data Form, habitats 3130, 3160, 4030, 4060, 6170, 6210, 6430, 7140, 7150, 7230, 8110, 8220, *8240. There are many lakes on the plateau which are **3130 Upland oligotrophic lakes** and **3160 Dystrophic lakes**. **4030 Dry heath** is fairly common throughout the site and accounts for 9.2% of the area. **4060 Alpine and Boreal heaths** covers 2.9% of the site and is a prominent feature of the highest ground. Grassland at Loughmuirran with *Silene acaulis* and *Encalypta alpina* is referable to **6170 Alpine and subalpine calcareous grassland.** *Carex rostrata* flushes with affinities to **7140 Transition mires** occur in the valley near Cloghmeen whilst **7150 *Rhynchosporion* depressions** occur in a small area in the southeast of the site. Some of the better grassland qualifies as **6120 Calcareous grassland**. On the northern cliffs small patches of **6430 Hydrophilous tall herb communities** occur. Brown moss and small sedge communities that come under **7230 Alkaline fens** occur across the site. There are also some good patches of ***8240 Limestone pavements** in the southeast of the site. Areas of **8110 Siliceous scree** and **8220 Siliceous rocky slopes** are present but are small or marginal examples.

4.2 The current version of the Natura 2000 Standard Data Form for this site estimates the area of **4010 Wet heaths** to be 40% of the site whereas this survey has estimated it to be substantially lower at 7.7%. Conversely, the form has underestimated the area of **7130/*7130 Blanket bogs** (18% compared with the survey figure of 54.7%). This is likely to be due to interpretation of the habitats.

4.3 The Natura 2000 Standard Data Form for this site should be reviewed and updated in light of the data presented in this report in terms of the habitats listed, areas and ratings. It is obligatory that all Annex I habitats within an SAC are listed on this form even if they are subsequently ranked as having a non-significant presence.

Additional recommendations

4.4 Whilst a Conservation Statement exists for Arroo Mountain cSAC (NPWS 2009), a Conservation Plan is required which should utilise the information provided by this report. Management objectives in the plan need to address the impacts highlighted in this report if progress is to be made towards attaining Favourable status for the Annex I habitats. The four major impacts are livestock grazing, turf-cutting by machine and peat erosion.

4.5 Levels of livestock grazing are being addressed through the CFP. Whilst CFP reductions in stock numbers appears to have resulted in some improvement to Annex I habitats, these habitats are not currently attaining Favourable status. Continued monitoring is required to establish what would be sustainable levels of livestock for this site bearing in mind that there may be a considerable delay between changes in livestock levels and a response in the vegetation. The available data do not support an increase in stocking levels.

4.6 Erosion of upland blanket peat is a major impact in ***7130/7130 Blanket bogs.** Whilst some areas of eroded peat may gradually revegetate as a result of CFP reductions in stock numbers, in areas of more severe erosion active restoration measures may be needed for this habitat to achieve Favourable status. These may include the damming of erosion gullies, stabilisation of bare peat with geotextiles or heather brash, the planting of *Eriophorum angustifolium*, and seeding of bare peat with *Sphagnum* propagules. The conservation of ***7130 Active blanket bog** should be prioritised as befitting its status.

4.7 Active turf-cutting by sausage machine and machine-cutting of turf banks is occurring at several locations within the site having a major localised impact on ***7130/7130 Blanket bogs**. Appropriate regulation of machine turf-cutting is required within the site.

4.8 It would be desirable for future phases of monitoring to expand on the network of monitoring stops established by this survey. Placement of additional stops should take into account the spatial distribution of existing stops.

4.9 Monitoring criteria should be developed for **6430 Hydrophilous tall herb communities**. Relevé data collected by this survey will allow these habitats to be, in part, retrospectively assessed.

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APPENDIX 1: ANNEX I HABITATS

The following standard abbreviations are used throughout this report for Annex I habitats. With the exception of habitats 4060, 6170 and 7130, these follow the abbreviations used in NPWS (2008).

Annex I code	Full name of Annex I habitat	Standard abbreviation
3130	Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*	3130 Upland oligotrophic lakes
3160	Natural dystrophic lakes and ponds	3160 Dystrophic lakes
4010	Northern Atlantic wet heaths with *Erica tetralix*	4010 Wet heaths
4030	European dry heaths	4030 Dry heaths
4060	Alpine and Boreal heaths	4060 Alpine and Boreal heaths
6170	Alpine and subalpine calcareous grassland	6170 Alpine and subalpine calcareous grassland
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates(Festuco-Brometalia) (* important orchid sites)	6210 Calcareous grassland or *6210 Orchid-rich grassland
6430	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	6430 Hydrophilous tall herb communities
7130	Blanket bogs (* if active bog)	*7130 Active blanket bog or 7130 Inactive blanket bog or *7130/7130 Blanket bog
7140	Transition mires and quaking bogs	7140 Transition mires
7150	Depressions on peat substrates of the *Rhynchosporion*	7150 *Rhynchosporion* depressions
7220	*Petrifying springs with tufa formation (*Cratoneurion*)	7220 Petrifying springs
7230	Alkaline fens	7230 Alkaline fens
8110	Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsetalia ladani*)	8110 Siliceous scree
8120	Calcareous and calcshist screes of the montane to alpine levels (*Thlaspietea rotundifolii*)	8120 Calcareous scree
8210	Calcareous rocky slopes with chasmophytic vegetation	8210 Calcareous rocky slopes
8220	Siliceous rocky slopes with chasmophytic vegetation	8220 Siliceous rocky slopes
8240	Limestone pavements	*8240 Limestone pavements

APPENDIX 2: PHOTOGRAPHS

Plate A1: *Huperzia selago* and *Cladonia* sp. in 4030 Dry heath vegetation on the Arroo plateau (Photo: Kristi Leyden).

Plate A2: *Saxifraga aizoides* and *Sedum rosea* on 8210 Calcareous rocky slopes (Photo: Rory Hodd).

Plate A3: 4010 Wet heath vegetation on the summit plateau of Arroo (Photo: Eamonn O'Sullivan).

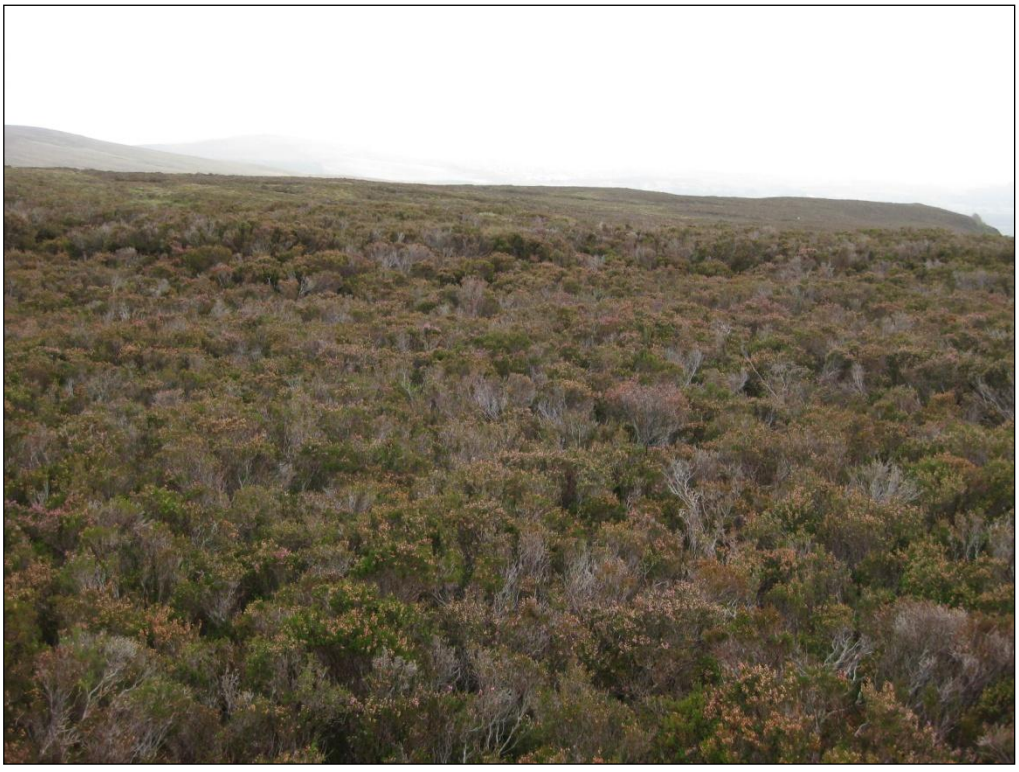

Plate A4: 4030 Dry heath, dominated by *Calluna vulgaris*, Gubinea (Photo: Eamonn O'Sullivan).

Plate A5: 4060 Alpine and Boreal heath, with *Calluna vulgaris* and *Racomitrium lanuginosum*, south of the summit of Arroo (Photo: Janice Fuller).

Plate A6: *7130 Active blanket bog vegetation covering the undulating plateau of Arroo (Photo: Eamonn O'Sullivan).

Plate A7: 7140 Transition mire, containing *Carex rostrata*, *Potamogeton polygonifolius* and *Sphagnum denticulatum* in a boggy valley on the Arroo plateau (Photo: Annika Korsten).

Plate A8: 7230 Alkaline fen, Aghaderrard East, occurring as a flush within *7130 Active blanket bog (Photo: Rory Hodd).

Plate A9: Stream valley containing PF2 Poor fen and flush and GS3 Dry-humid acid grassland (Photo: Kristi Leyden).

Plate A10: 6170 Alpine and subalpine calcareous grassland on a rocky calcareous bluff, Keeloges, with *Silene acaulis*, *Saxifraga oppositifolia* and *Encalypta rhaptocarpa* (Photo: Rory Hodd).

Plate A11: 8120 Calcareous scree below the northern cliffs of Arroo, Aghadunvane, wherein occur species including *Saxifraga oppositifolia*, *Saxifraga aizoides* and *Cystopteris fragilis* (Photo: Rory Hodd).

Plate A12: 8210 Calcareous rocky slope, Gorteendarragh, with *Asplenium trichomanes*, *Cystopteris fragilis* and *Hieracium* sp. (Photo: Rory Hodd).

Plate A13: Hydrophilous tall herb vegetation on cliff ledge, with *Alchemilla glabra* and *Crepis paludosa* prominent, Largydonnell (Photo: Rory Hodd).

Plate A14: *8240 Limestone pavement among 4030 Dry heath and *7130 Active blanket bog vegetation (Photo: Kristi Leyden).

Plate A15: The northern cliffs of Arroo at Gortnasillagh and Gorteendarragh (Photo: Mark O'Callaghan).

Plate A16: View across the rolling plateau of Arroo, towards Keeloges and Aghalateeve, from below Lough Aganny (Photo: Kristi Leyden).

Plate A17: Mudslide in GS3 Dry-humid acid grassland, below the northern cliffs of Arroo, Gorteendarragh (Photo: BEC Consultants).

APPENDIX 3: PLANT SPECIES LIST

All species recorded from relevés, waypoints and polygons during the NSUH survey are listed.

VASCULAR SPECIES

Species name	Common name
Agrostis canina	Velvet Bent
Agrostis capillaris	Common Bent
Agrostis stolonifera	Creeping Bent
Alchemilla glabra	a Lady's-mantle
Anthoxanthum odoratum	Sweet Vernal-grass
Arabis hirsuta	Hairy Rock-cress
Asplenium ruta-muraria	Wall-rue
Asplenium trichomanes	Maidenhair Spleenwort
Bellis perennis	Daisy
Betula pubescens	Downy Birch
Blechnum spicant	Hard-fern
Briza media	Quaking-grass
Calluna vulgaris	Heather
Campanula rotundifolia	Harebell
Cardamine pratensis	Cuckooflower
Carex binervis	Green-ribbed Sedge
Carex echinata	Star Sedge
Carex flacca	Glaucous Sedge
Carex nigra	Common Sedge
Carex panicea	Carnation Sedge
Carex paniculata	Greater Tussock-sedge
Carex pilulifera	Pill Sedge
Carex pulicaris	Flea Sedge
Carex rostrata	Bottle Sedge
Carex viridula	Yellow-sedge
Carex viridula subsp. *brachyrrhyncha*	a Yellow-sedge
Cerastium fontanum	Common Mouse-ear
Corylus avellana	Hazel
Crepis paludosa	Marsh Hawk's-beard
Cystopteris fragilis	Brittle Bladder-fern
Deschampsia cespitosa	Tufted Hair-grass
Deschampsia flexuosa	Wavy Hair-grass
Drosera intermedia	Oblong-leaved Sundew
Drosera rotundifolia	Round-leaved Sundew
Dryopteris dilatata	Broad Buckler-fern
Empetrum nigrum	Crowberry
Epilobium brunnescens	New Zealand Willowherb
Erica cinerea	Bell Heather
Erica tetralix	Cross-leaved Heath
Eriophorum angustifolium	Common Cottongrass

VASCULAR SPECIES

Species name	Common name
Eriophorum vaginatum	Hare's-tail Cottongrass
Euphrasia officinalis agg.	Eyebright
Festuca ovina	Sheep's-fescue
Festuca rubra	Red Fescue
Fraxinus excelsior	Ash
Galium palustre	Common Marsh-bedstraw
Galium saxatile	Heath Bedstraw
Galium sterneri	Limestone Bedstraw
Geranium robertianum	Herb-Robert
Gymnadenia sp.	an Orchid
Hedera helix	Ivy
Hieracium sp.	a Hawkweed
Holcus lanatus	Yorkshire-fog
Huperzia selago	Fir Clubmoss
Ilex aquifolium	Holly
Juncus acutiflorus	Sharp-flowered Rush
Juncus bulbosus	Bulbous Rush
Juncus effusus	Soft-rush
Juncus squarrosus	Heath Rush
Larix sp.	a Larch
Leontodon autumnalis	Autumn Hawkbit
Linum catharticum	Fairy Flax
Listera cordata	Lesser Twayblade
Lotus sp.	a Bird's-foot-trefoil
Luzula campestris	Field Wood-rush
Luzula sylvatica	Great Wood-rush
Mentha aquatica	Water Mint
Menyanthes trifoliata	Bogbean
Molinia caerulea	Purple Moor-grass
Nardus stricta	Mat-grass
Narthecium ossifragum	Bog Asphodel
Oxalis acetosella	Wood-sorrel
Parnassia palustris	Grass-of-Parnassus
Phyllitis scolopendrium	Hart's-tongue
Pinguicula vulgaris	Common Butterwort
Pinus sylvestris	Scots Pine
Plantago maritima	Sea Plantain
Polygala serpyllifolia	Heath Milkwort
Polystichum lonchitis	Holly-fern
Potamogeton polygonifolius	Bog Pondweed
Potentilla erecta	Tormentil
Primula vulgaris	Primrose
Prunus spinosa	Blackthorn

VASCULAR SPECIES

Species name	Common name
Quercus petraea	Sessile Oak
Ranunculus bulbosus	Bulbous Buttercup
Ranunculus flammula	Lesser Spearwort
Ranunculus repens	Creeping Buttercup
Rhinanthus minor	Yellow-rattle
Rhynchospora alba	White Beak-sedge
Rosa sp.	a Rose
Rubus fruticosus agg.	Brambles
Sagina nodosa	Knotted Pearlwort
Salix phylicifolia	Tea-leaved Willow
Saxifraga aizoides	Yellow Saxifrage
Saxifraga hypnoides	Mossy Saxifrage
Saxifraga oppositifolia	Purple Saxifrage
Saxifraga rosacea subsp. *rosacea*	Irish Saxifrage
Sedum rosea	Roseroot
Sesleria caerulea	Blue Moor-grass
Sorbus aucuparia	Rowan
Stellaria palustris	Marsh Stitchwort
Succisa pratensis	Devil's-bit Scabious
Taraxacum officinale agg.	Dandelion
Thymus polytrichus	Wild Thyme
Trichophorum germanicum	Deergrass
Trifolium pratense	Red Clover
Urtica dioica	Common Nettle
Vaccinium myrtillus	Bilberry
Vaccinium oxycoccos	Cranberry
Veronica officinalis	Heath Speedwell
Viola riviniana	Common Dog-violet

BRYOPHYTES

Species name	Common name
Anastrepta orcadensis	Orkney Notchwort
Aneura pinguis	Greasewort
Anomodon viticulosus	Rambling Tail-moss
Aulacomnium palustre	Bog Groove-moss
Barbilophozia floerkei	Common Pawwort
Barbula unguiculata	Bird's-claw Beard-moss
Breutelia chrysocoma	Golden-head Moss
Bryum pallens	Pale Thread-moss
Bryum pseudotriquetrum	Marsh Bryum
Calliergon giganteum	Giant Spear-moss
Calliergonella cuspidata	Pointed Spear-moss

BRYOPHYTES

Species name	Common name
Calypogeia fissa	Common Pouchwort
Calypogeia muelleriana	Mueller's Pouchwort
Campylium stellatum	Yellow Starry Feather-moss
Campylopus flexuosus	Rusty Swan-neck Moss
Campylopus fragilis	Brittle Swan-neck Moss
Campylopus introflexus	Heath Star Moss
Conocephalum sp.	a Scented Liverwort
Cratoneuron filicinum	Fern-leaved Hook-moss
Ctenidium molluscum	Chalk Comb-moss
Dicranella varia	Variable Forklet-moss
Dicranum scoparium	Broom Fork-moss
Didymodon ferrugineus	Rusty Beard-moss
Didymodon spadiceus	Brown Beard-moss
Diplophyllum albicans	White Earwort
Distichium capillaceum	Fine Distichium
Distichium inclinatum	Inclined Distichium
Ditrichum gracile	Slender Ditrichum
Encalypta rhaptocarpa	Ribbed Extinguisher-moss
Encalypta streptocarpa	Spiral Extinguisher-moss
Eurhynchium striatum	Common Striated Feather-moss
Fissidens adianthoides	Maidenhair Pocket-moss
Fissidens dubius	Rock Pocket-moss
Fissidens osmundoides	Purple-stalked Pocket-moss
Fissidens taxifolius	Common Pocket-moss
Frullania tamarisci	Tamarisk Scalewort
Homalothecium sericeum	Silky Wall Feather-moss
Hylocomium splendens	Glittering Wood-moss
Hymenostylium recurvirostrum var. *recurvirostrum*	Hook-beak Tufa-moss
Hypnum cupressiforme var. *lacunosum*	Great Plait-moss
Hypnum jutlandicum	Heath Plait-moss
Jungermannia sp.	a Flapwort
Kurzia trichoclados	Heath Fingerwort
Leiocolea badensis	Scarce Notchwort
Leiocolea collaris	Mountain Notchwort
Lejeunea patens	Pearl Pouncewort
Lophozia sp.	a Notchwort
Lophozia ventricosa	Tumid Notchwort
Mnium marginatum	Bordered Thyme-moss
Mnium thomsonii	Short-beaked Thyme-moss
Mylia taylorii	Taylor's Flapwort
Neckera crispa	Crisped Neckera
Odontoschisma denudatum	Matchstick Flapwort
Odontoschisma sphagni	Bog-m Flapwort

BRYOPHYTES

Species name	Common name
Orthothecium intricatum	Fine-leaved Leskea
Orthothecium rufescens	Red Leskea
Oxyrrhynchium hians	Swartz's Feather-moss
Palustriella falcata	Claw-leaved Hook-moss
Pedinophyllum interruptum	Craven Featherwort
Pellia endiviifolia	Endive Pellia
Philonotis calcarea	Thick-nerved Apple-moss
Plagiochila porelloides	Lesser Featherwort
Plagiochila spinulosa	Prickly Featherwort
Plagiomnium undulatum	Hart's-tongue Thyme-moss
Plagiothecium undulatum	Waved Silk-moss
Pleurozia purpurea	Purple Spoonwort
Pleurozium schreberi	Red-stemmed Feather-moss
Pohlia sp.	a Thread-moss
Polytrichastrum alpinum	Alpine Haircap
Polytrichum formosum	Bank Haircap
Polytrichum juniperinum	Juniper Haircap
Preissia quadrata	Narrow Mushroom-headed Liverwort
Pseudoscleropodium purum	Neat Feather-moss
Pseudotaxiphyllum elegans	Elegant Silk-moss
Racomitrium ericoides	Dense Fringe-moss
Racomitrium lanuginosum	Woolly Fringe-moss
Rhizomnium punctatum	Dotted Thyme-moss
Rhynchostegiella tenella	Tender Feather-moss
Rhytidiadelphus loreus	Little Shaggy-moss
Rhytidiadelphus squarrosus	Springy Turf-moss
Rhytidiadelphus triquetrus	Big Shaggy-moss
Riccardia chamedryfolia	Jagged Germanderwort
Riccardia multifida	Delicate Germanderwort
Sarmentypnum sarmentosum	Twiggy Spear-moss
Scapania aequiloba	Lesser Rough Earwort
Scapania aspera	Rough Earwort
Scapania gracilis	Western Earwort
Scapania nemorea	Grove Earwort
Schistidium apocarpum	Sessile Grimmia
Scorpidium revolvens	Rusty Hook-moss
Scorpidium scorpioides	Hooked Scorpion-moss
Seligeria trifaria	Trifid Rock-bristle
Silene acaulis	Moss Campion
Sphagnum capillifolium	Red Bog-moss
Sphagnum capillifolium subsp. *capillifolium*	Acute-leaved Bog-moss
Sphagnum capillifolium subsp. *rubellum*	a Red Bog-moss
Sphagnum compactum	Compact Bog-moss

BRYOPHYTES

Species name	Common name
Sphagnum contortum	Twisted Bog-moss
Sphagnum cuspidatum	Feathery Bog-moss
Sphagnum denticulatum	Cow-horn Bog-moss
Sphagnum fimbriatum	Fringed Bog-moss
Sphagnum girgensohnii	Girgensohn's Bog-moss
Sphagnum inundatum	Lesser Cow-horn Bog-moss
Sphagnum palustre	Blunt-leaved Bog-moss
Sphagnum papillosum	Papillose Bog-moss
Sphagnum russowii	Russow's Bog-moss
Sphagnum subnitens	Lustrous Bog-moss
Sphagnum tenellum	Soft Bog-moss
Splachnum sphaericum	Round-fruited Collar-moss
Thamnobryum alopecurum	Fox-tail Feather-moss
Thuidium delicatulum	Delicate Tamarisk-moss
Thuidium tamariscinum	Common Tamarisk-moss
Timmia norvegica	Norway Timmia
Tortella tortuosa	Frizzled Crisp-moss
Trichostomum brachydontium	Variable Crisp-moss
Tritomaria quinquedentata	Lyon's Notchwort

LICHENS

Species name	Species name
Bunodophoron melanocarpum	*Cladonia strepsilis*
Cladonia ciliata var. *tenuis*	*Cladonia subcervicornis*
Cladonia bellidiflora	*Cladonia uncialis*
Cladonia cervicornis	*Cladonia uncialis* subsp. *biuncialis*
Cladonia ciliata	*Icmadophila ericetorum*
Cladonia ciliata var. *ciliata*	*Parmelia omphalodes*
Cladonia ciliata var. *tenuis*	*Parmelia saxatilis*
Cladonia coccifera	*Peltigera canina*
Cladonia crispata var. *cetrariiformis*	*Peltigera rufescens*
Cladonia floerkeana	*Pycnothelia papillaria*
Cladonia furcata	*Sphaerophorus globosus*
Cladonia portentosa	*Stereocaulon vesuvianum*
Cladonia squamosa var. *subsquamosa*	*Usnea subfloridana*

CHAROPHYCEAE

Species name	Common name
Chara sp.	a Stonewort

Figure 1. Survey area / cSAC boundary of Arroo Mountain cSAC (001403), Co. Leitrim

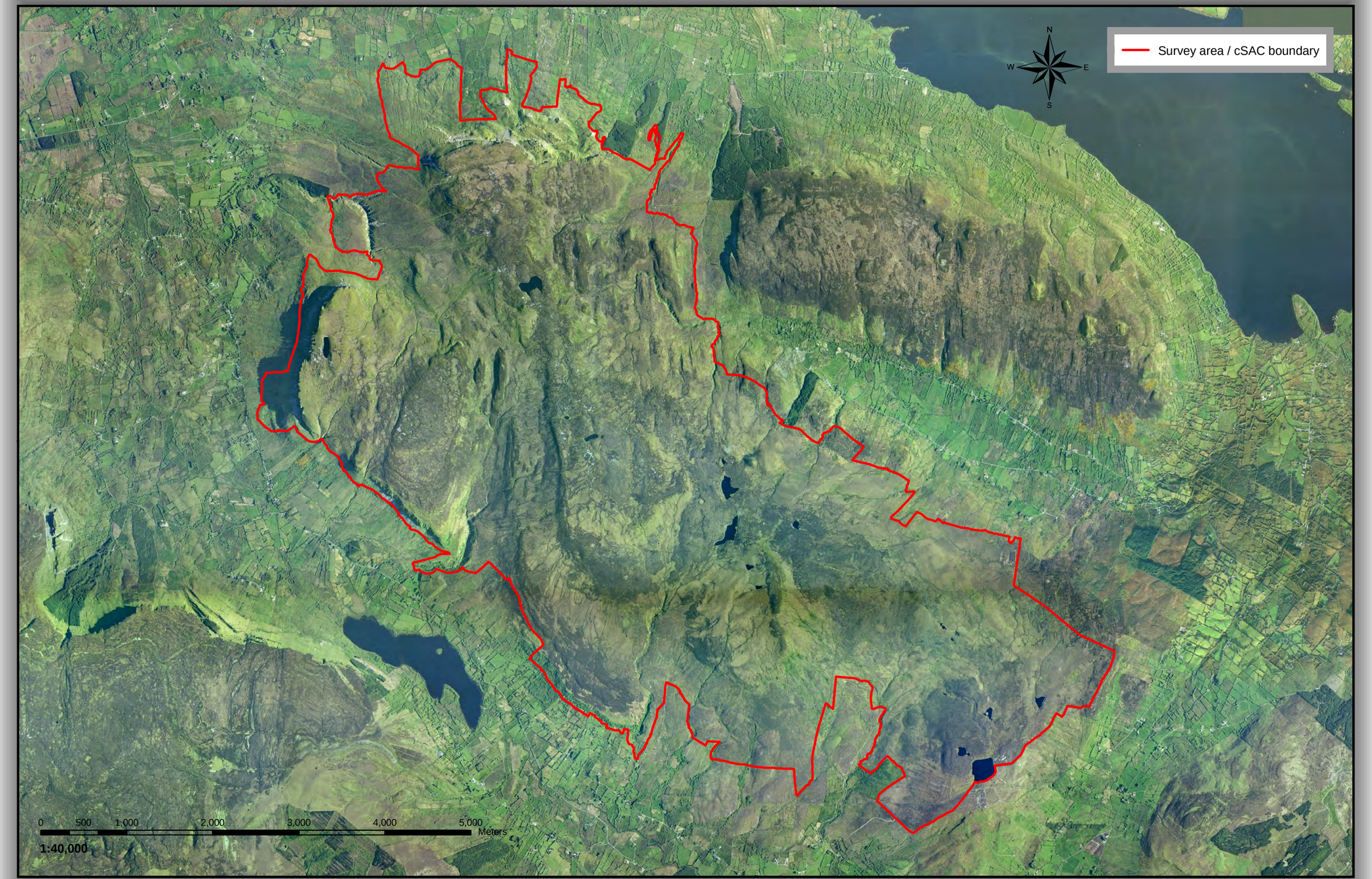

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Figure 2. Primary Fossitt habitats within Arroo Mountain cSAC (001403), Co. Leitrim

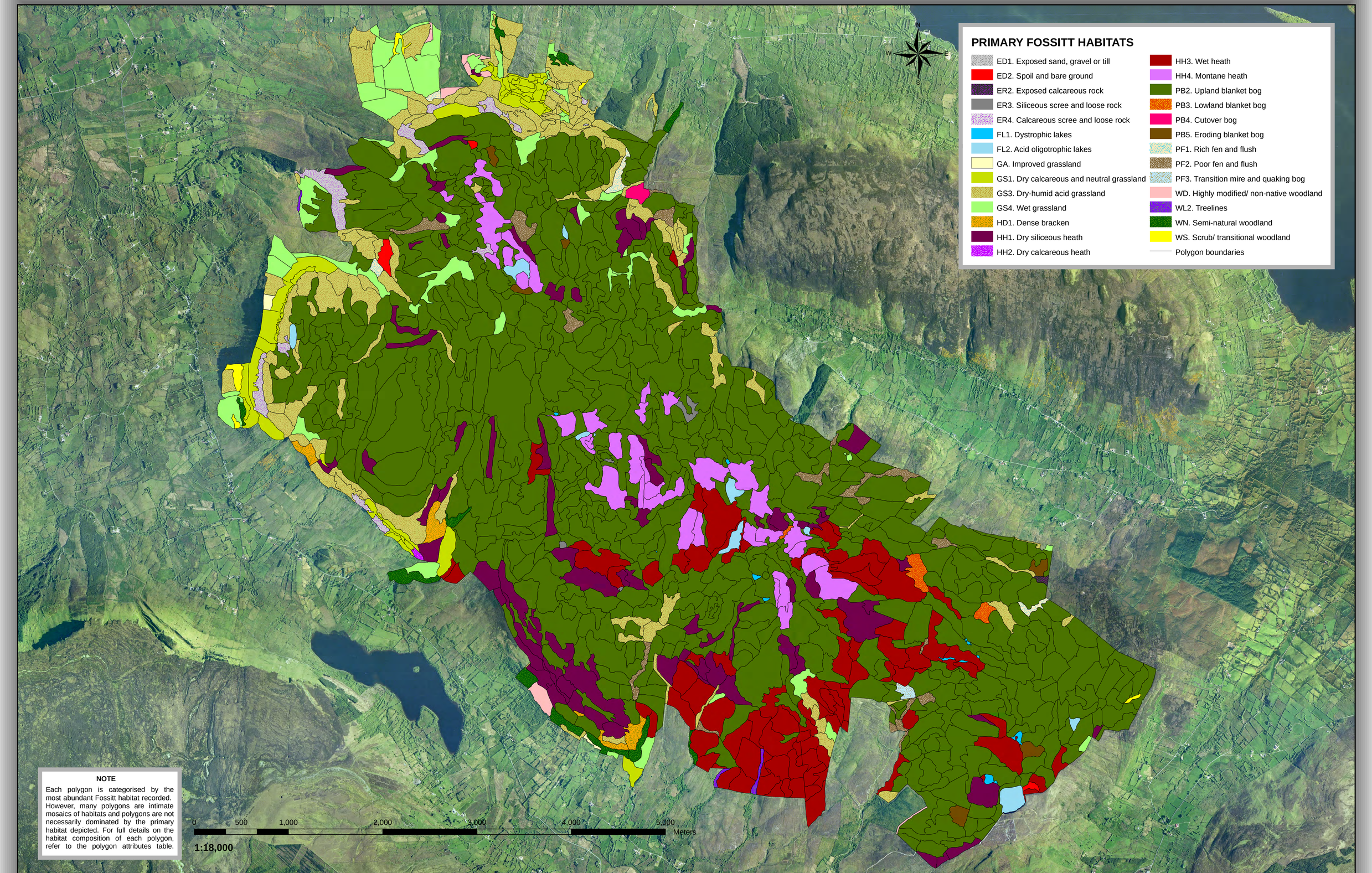

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Figure 3. Primary Annex I habitats within Arroo Mountain cSAC (001403), Co. Leitrim

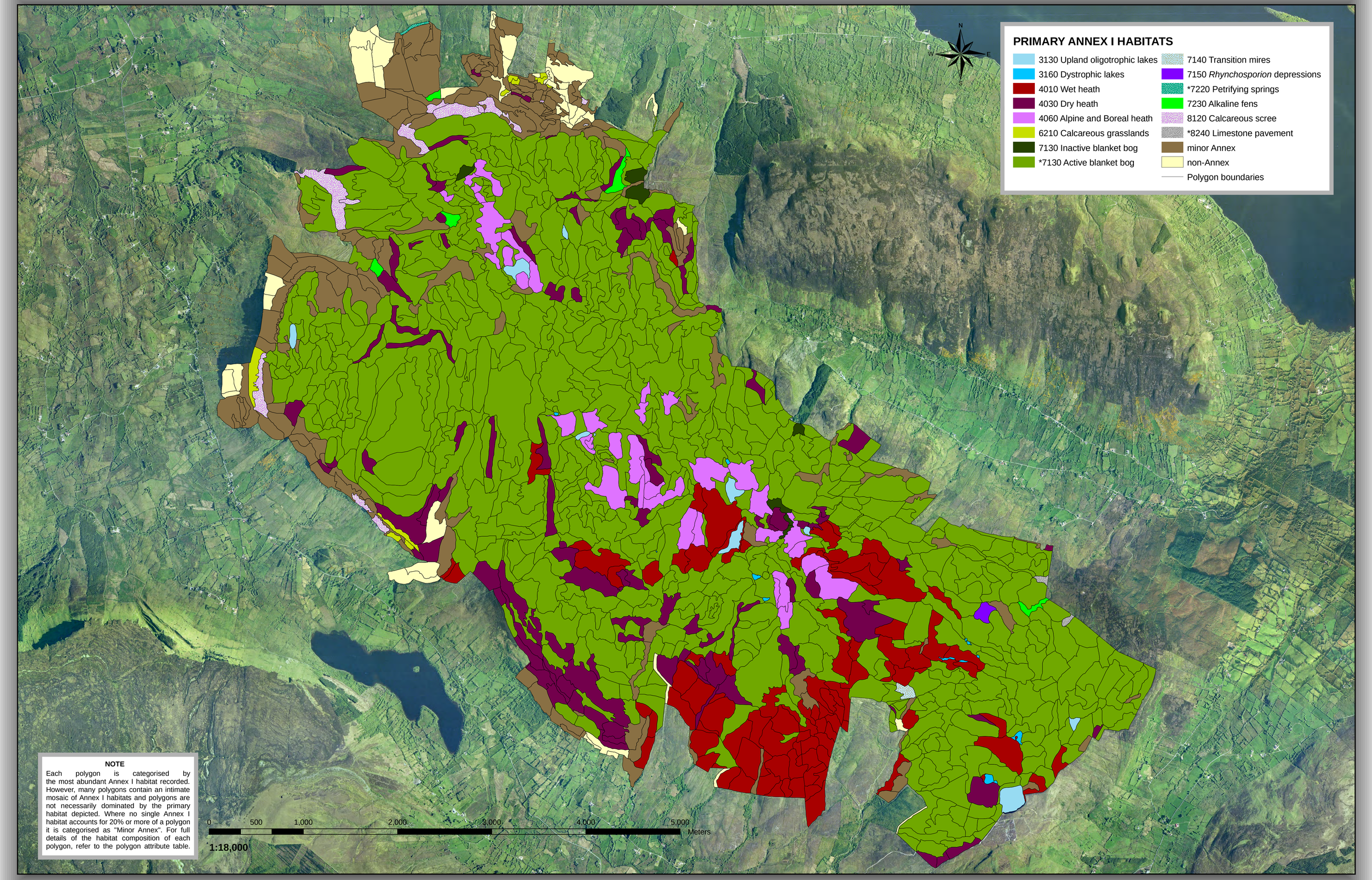

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Figure 4a. Cover of 4010 WET HEATH within Arroo Mountain cSAC (001403), Co. Leitrim

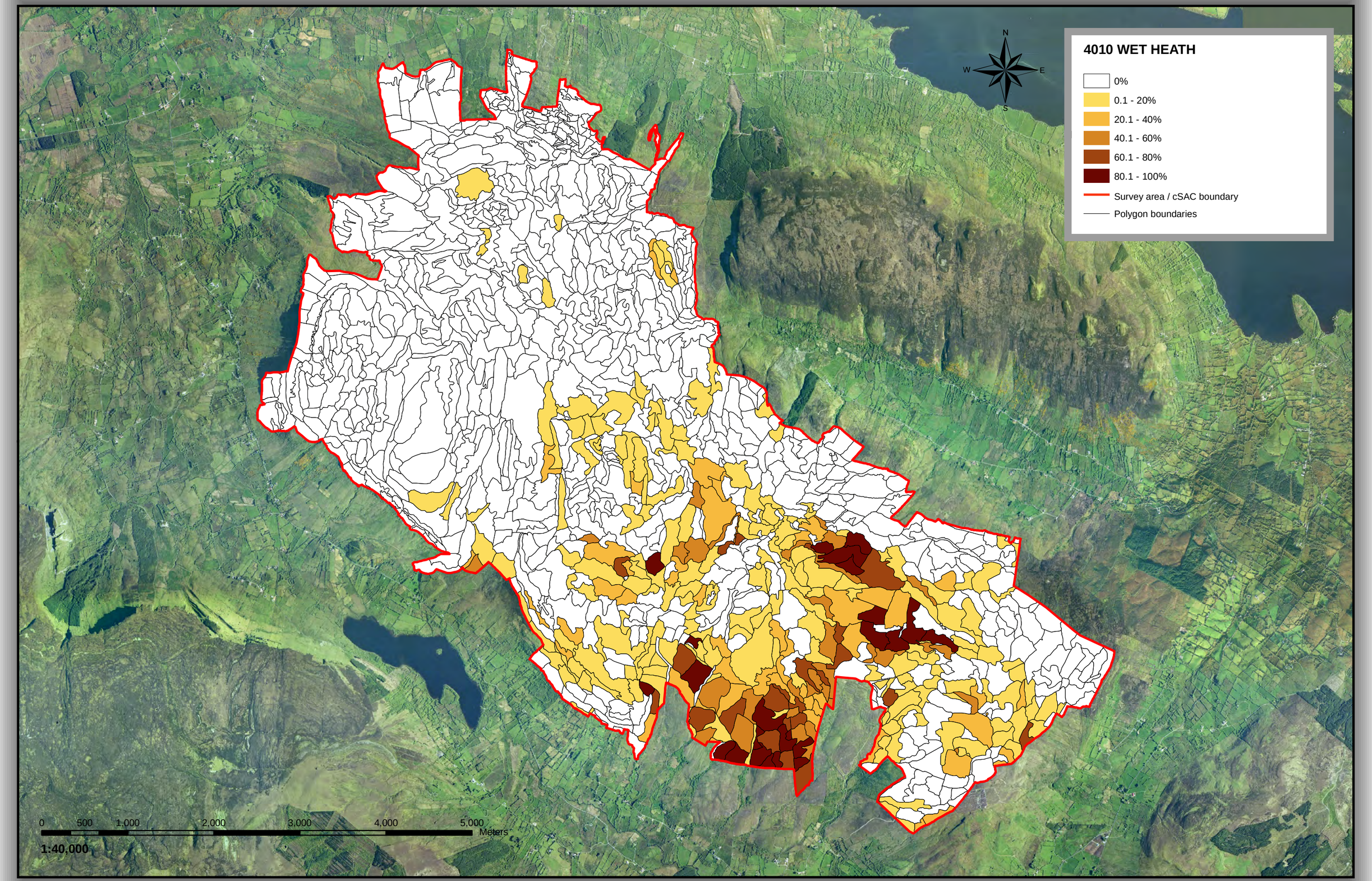

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Figure 4b. Cover of 4030 DRY HEATH within Arroo Mountain cSAC (001403), Co. Leitrim

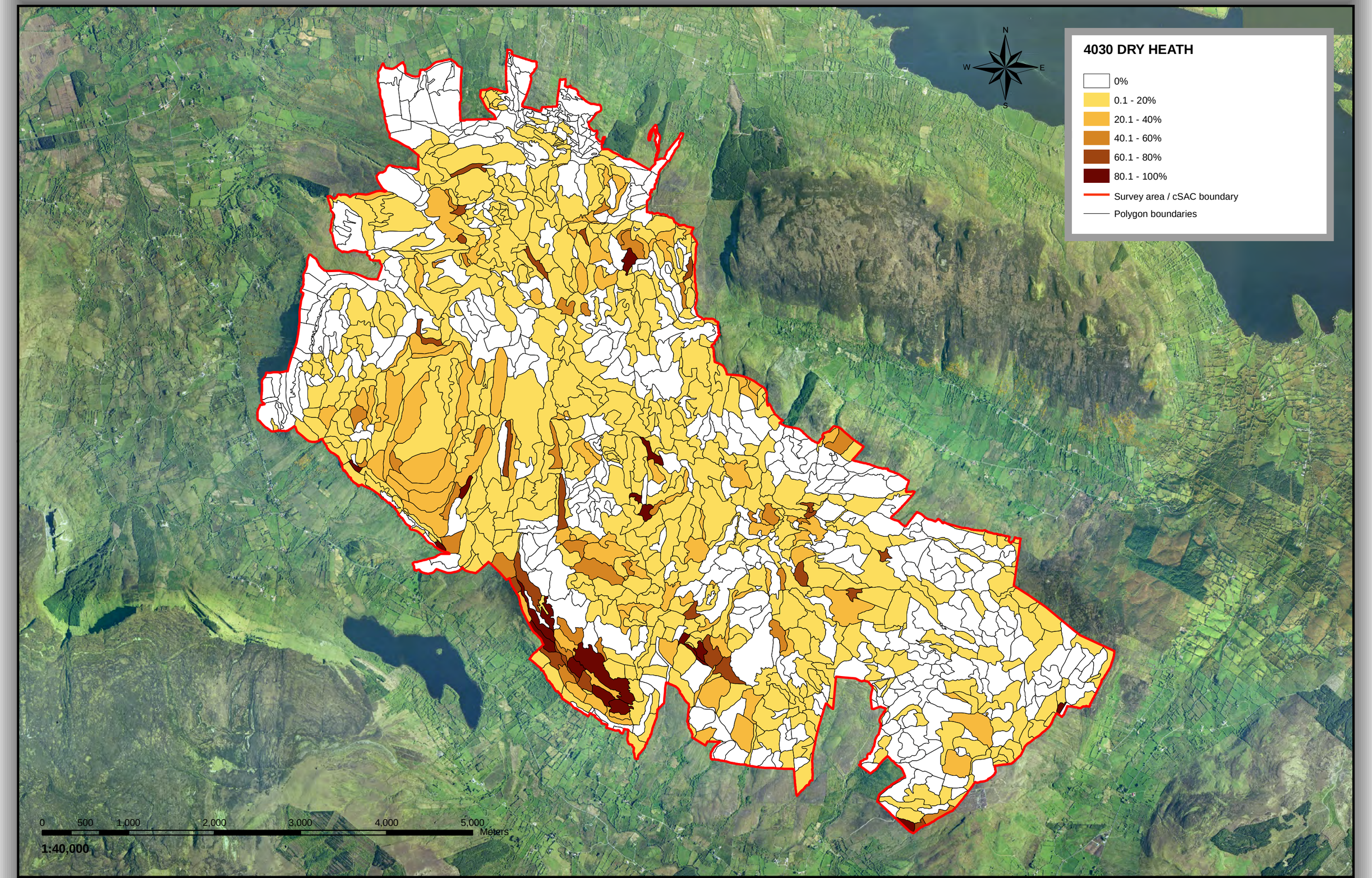

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Figure 4c. Cover of 4060 ALPINE AND BOREAL HEATH within Arroo Mountain cSAC (001403), Co. Leitrim

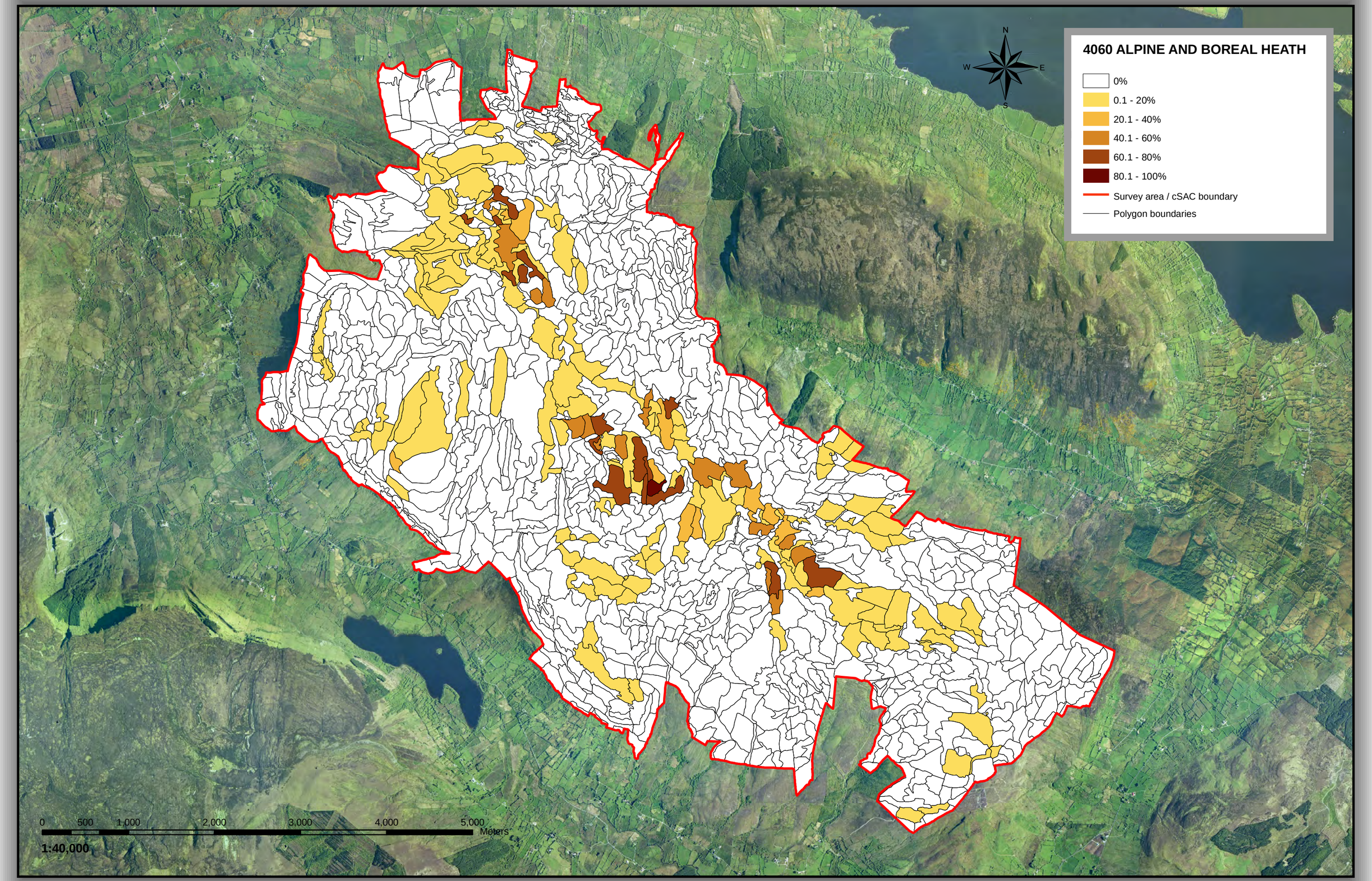

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Figure 4d. Cover of 6170 ALPINE AND SUBALPINE CALCAREOUS GRASSLANDS within Arroo Mountain cSAC (001403), Co. Leitrim

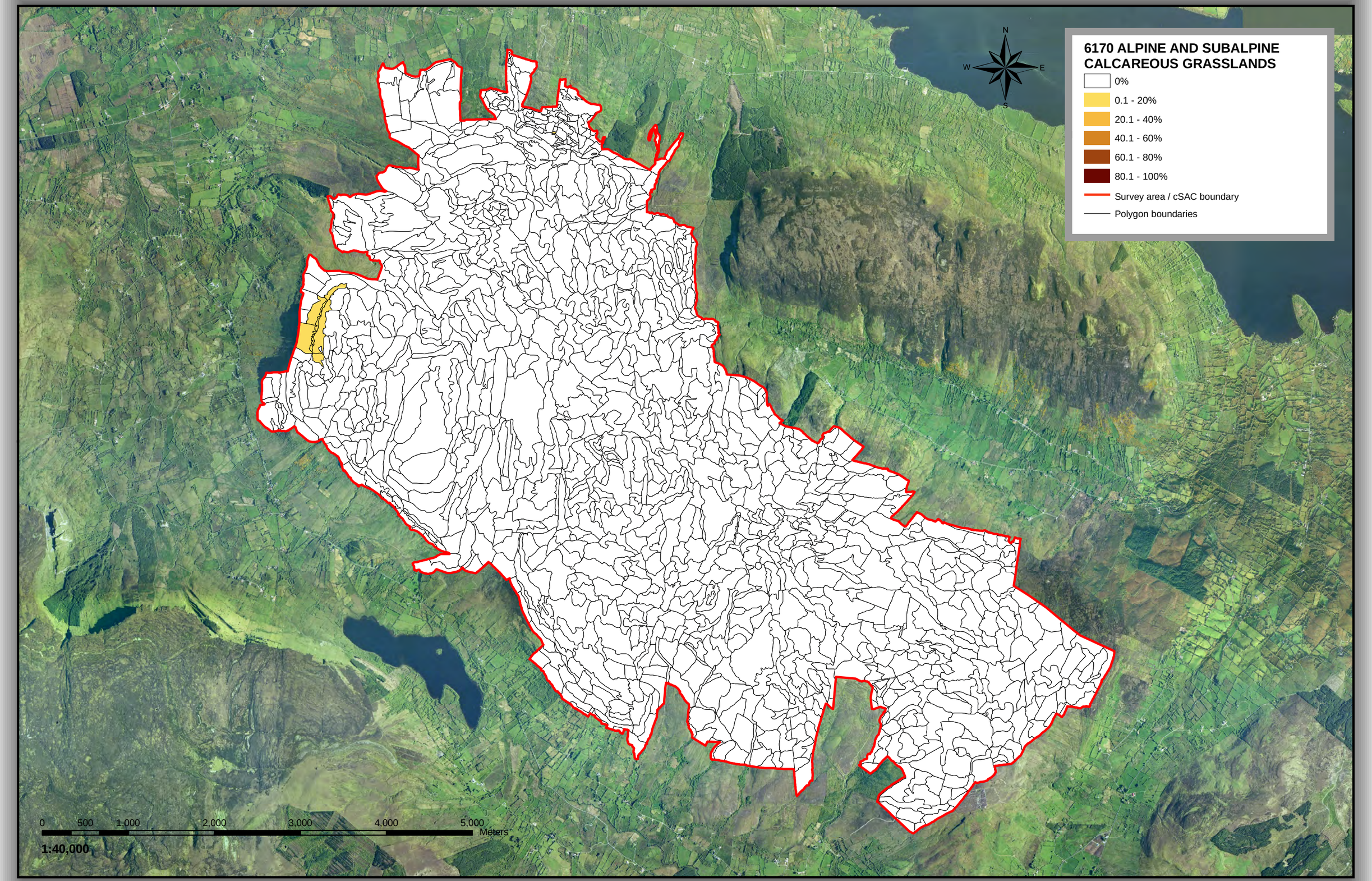

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Figure 4e. Cover of 6430 HYDROPHILOUS TALL HERB COMMUNITIES within Arroo Mountain cSAC (001403), Co. Leitrim

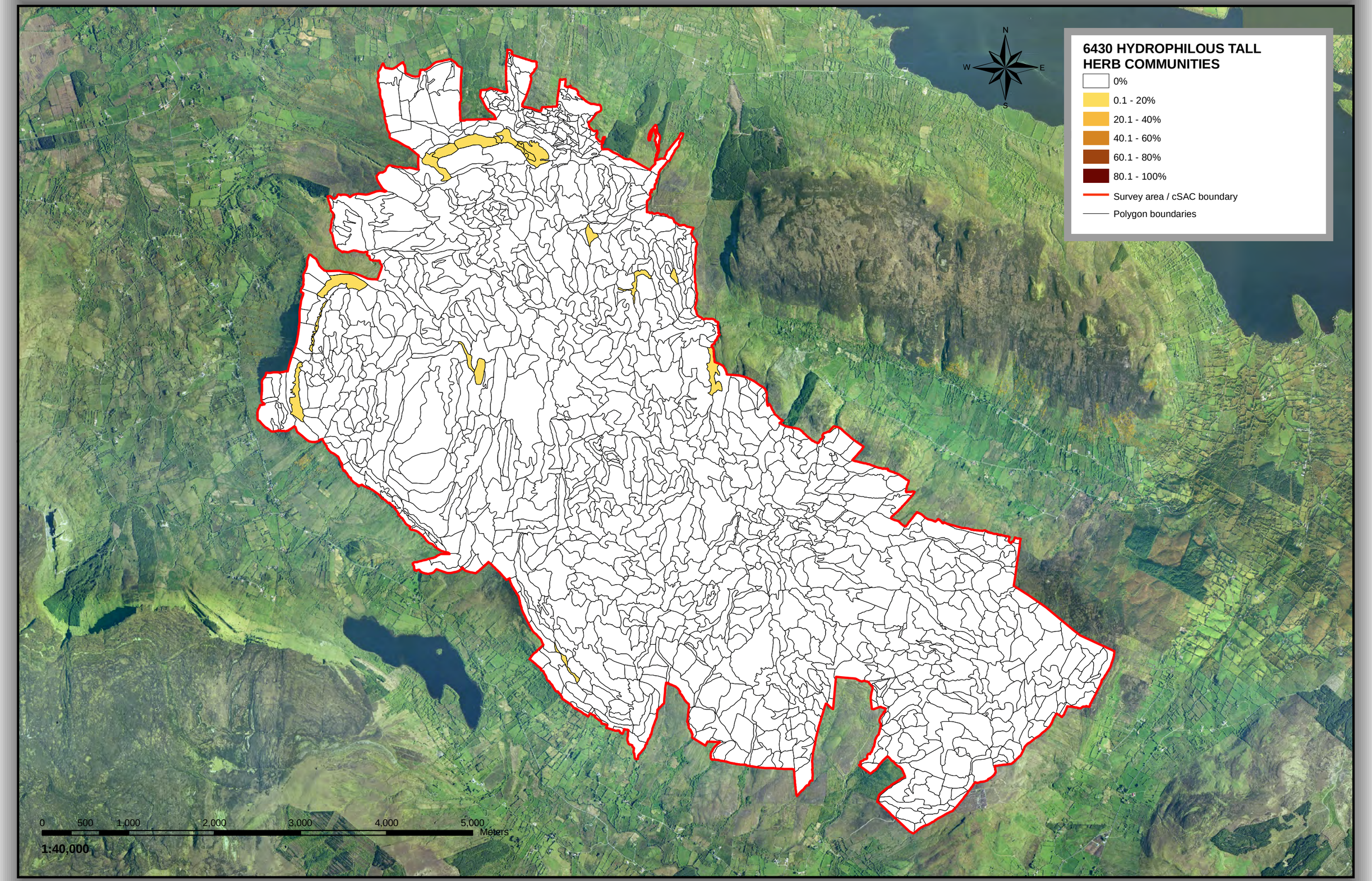

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Figure 4f. Cover of *7130 ACTIVE BLANKET BOG within Arroo Mountain cSAC (001403), Co. Leitrim

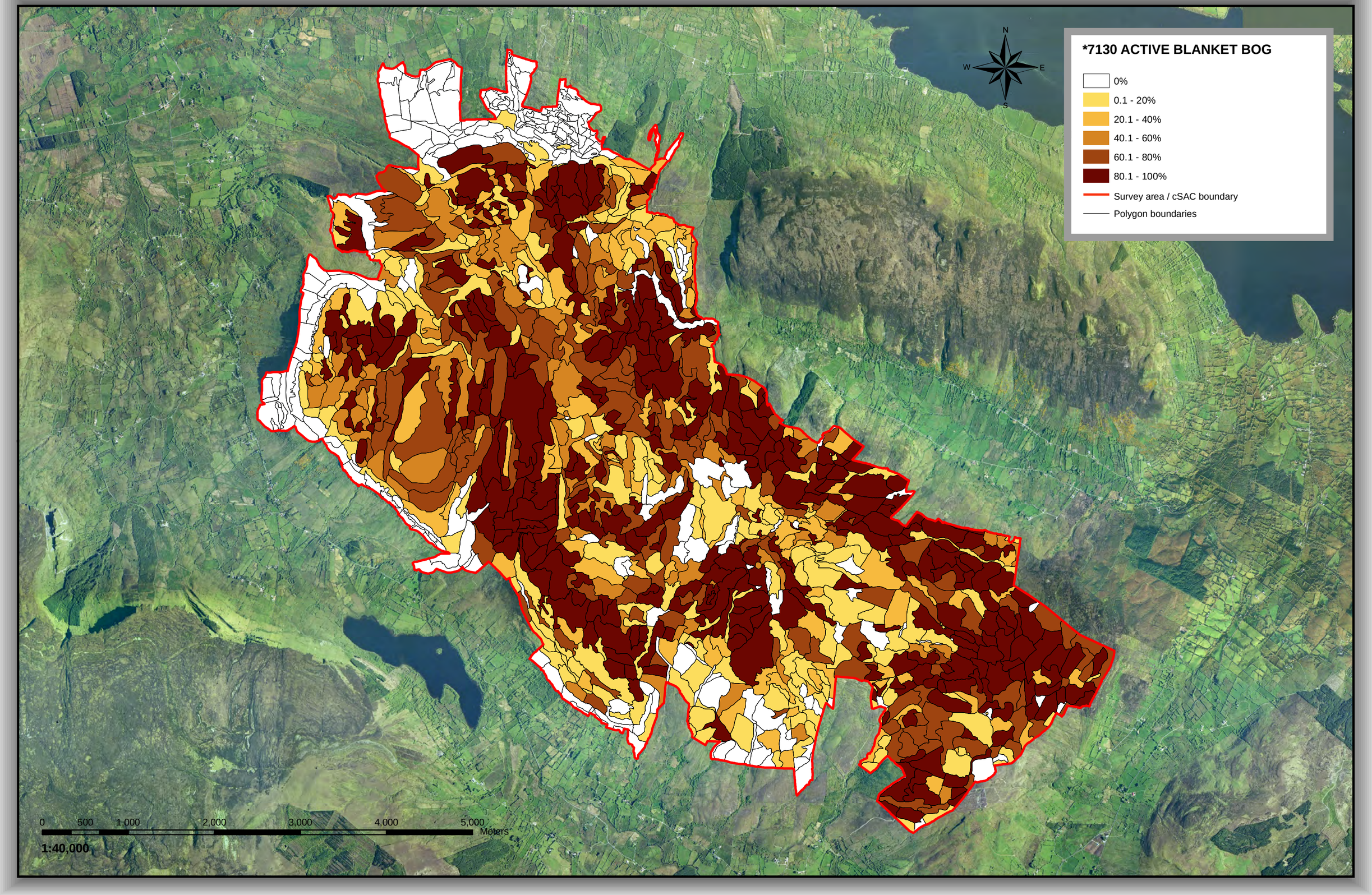

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Figure 4g. Cover of 7130 INACTIVE BLANKET BOG within Arroo Mountain cSAC (001403), Co. Leitrim

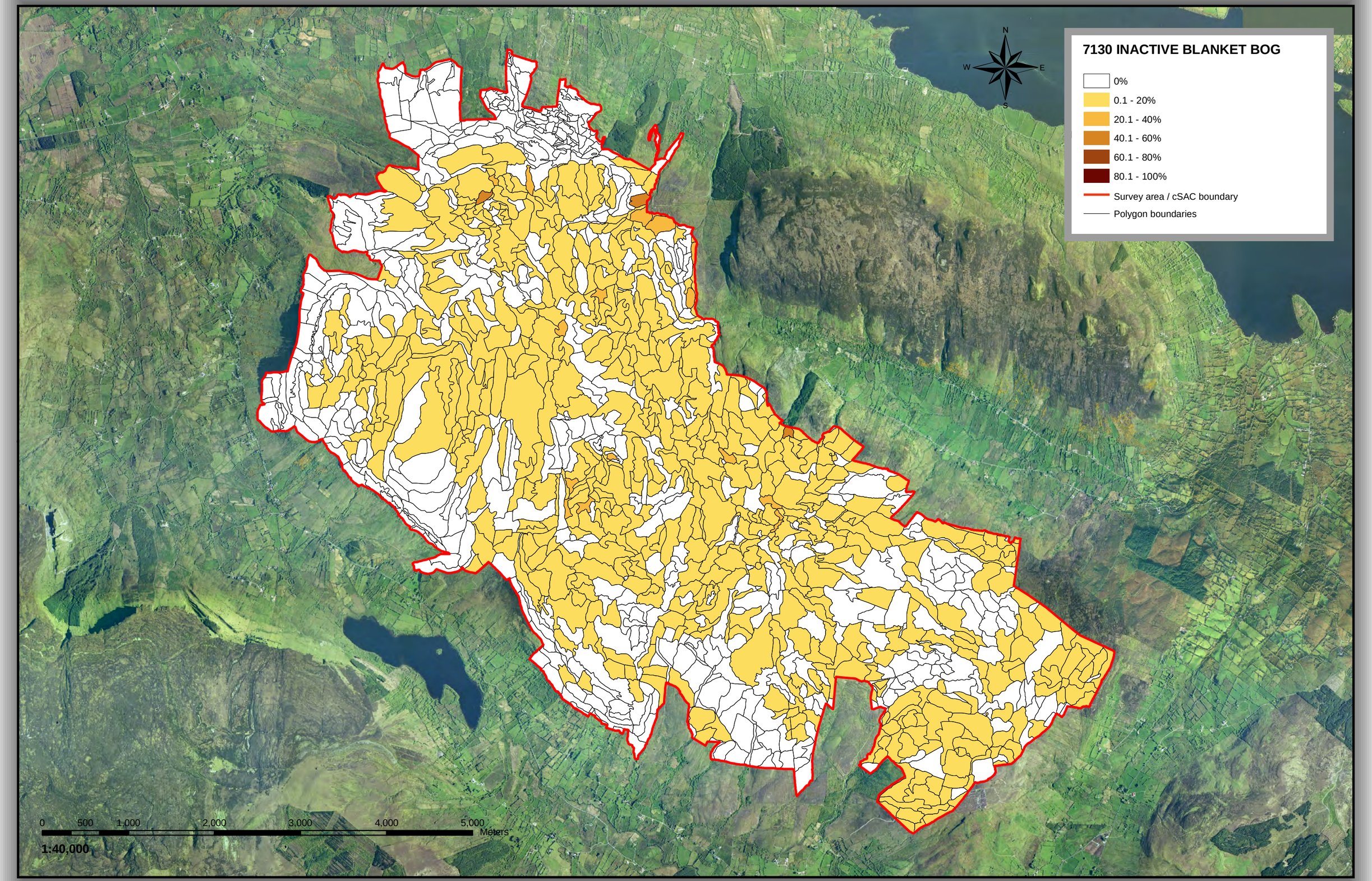

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Figure 4h. Cover of 7140 TRANSITION MIRES within Arroo Mountain cSAC (001403), Co. Leitrim

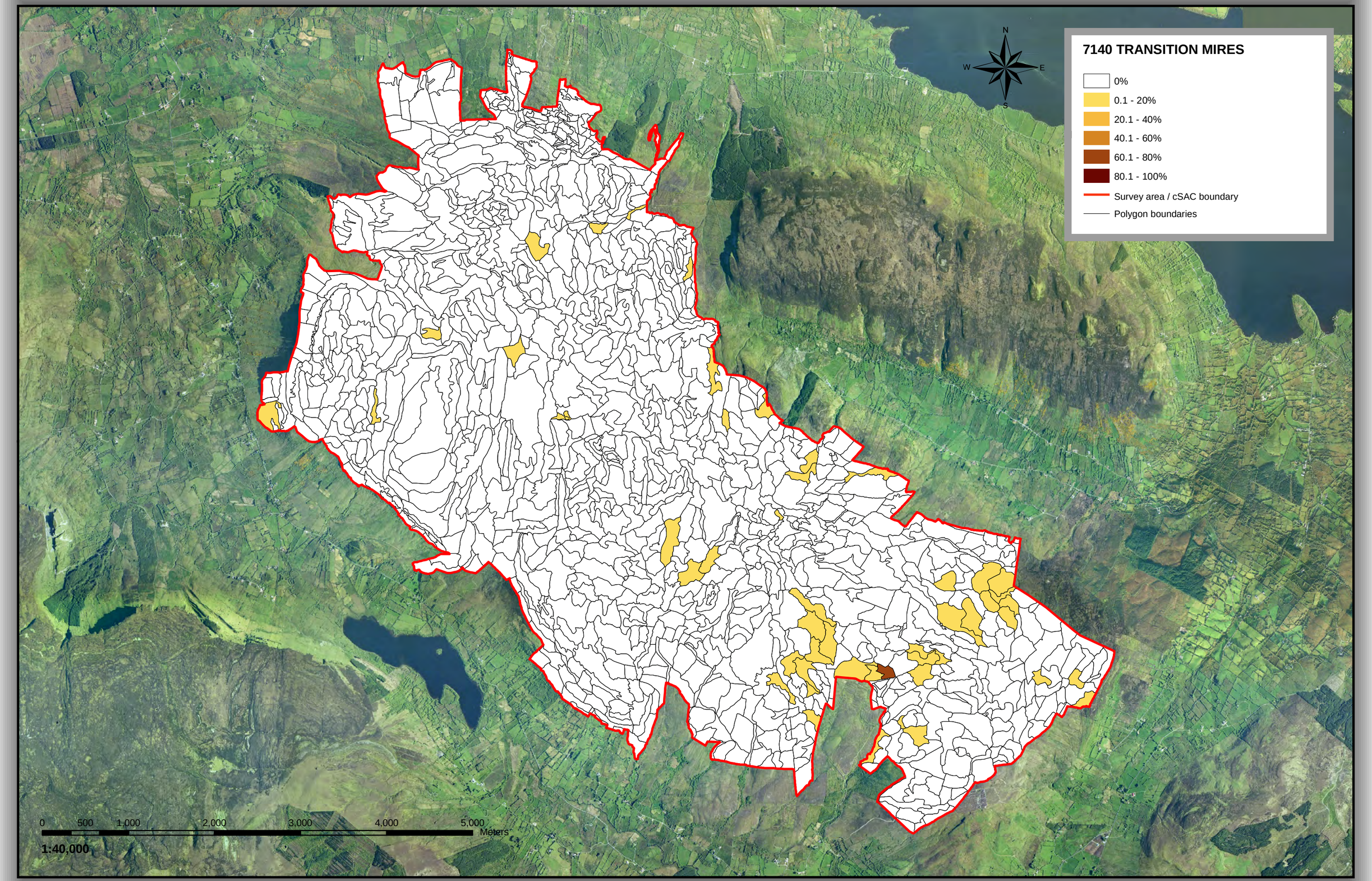

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Figure 4i. Cover of 7150 *RHYNCHOSPORION DEPRESSIONS* within Arroo Mountain cSAC (001403), Co. Leitrim

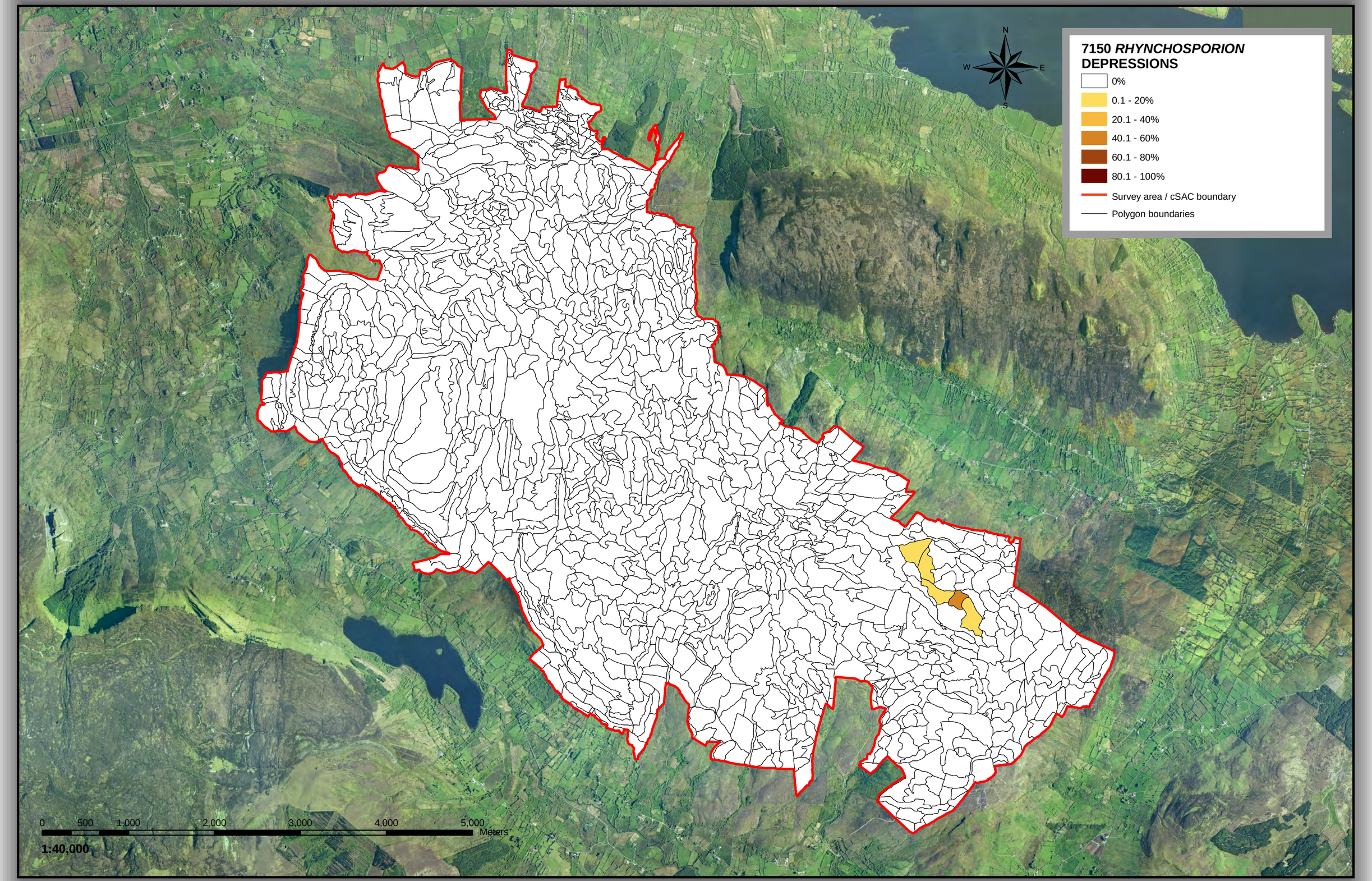

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Figure 4j. Cover of 7230 ALKALINE FENS within Arroo Mountain cSAC (001403), Co. Leitrim

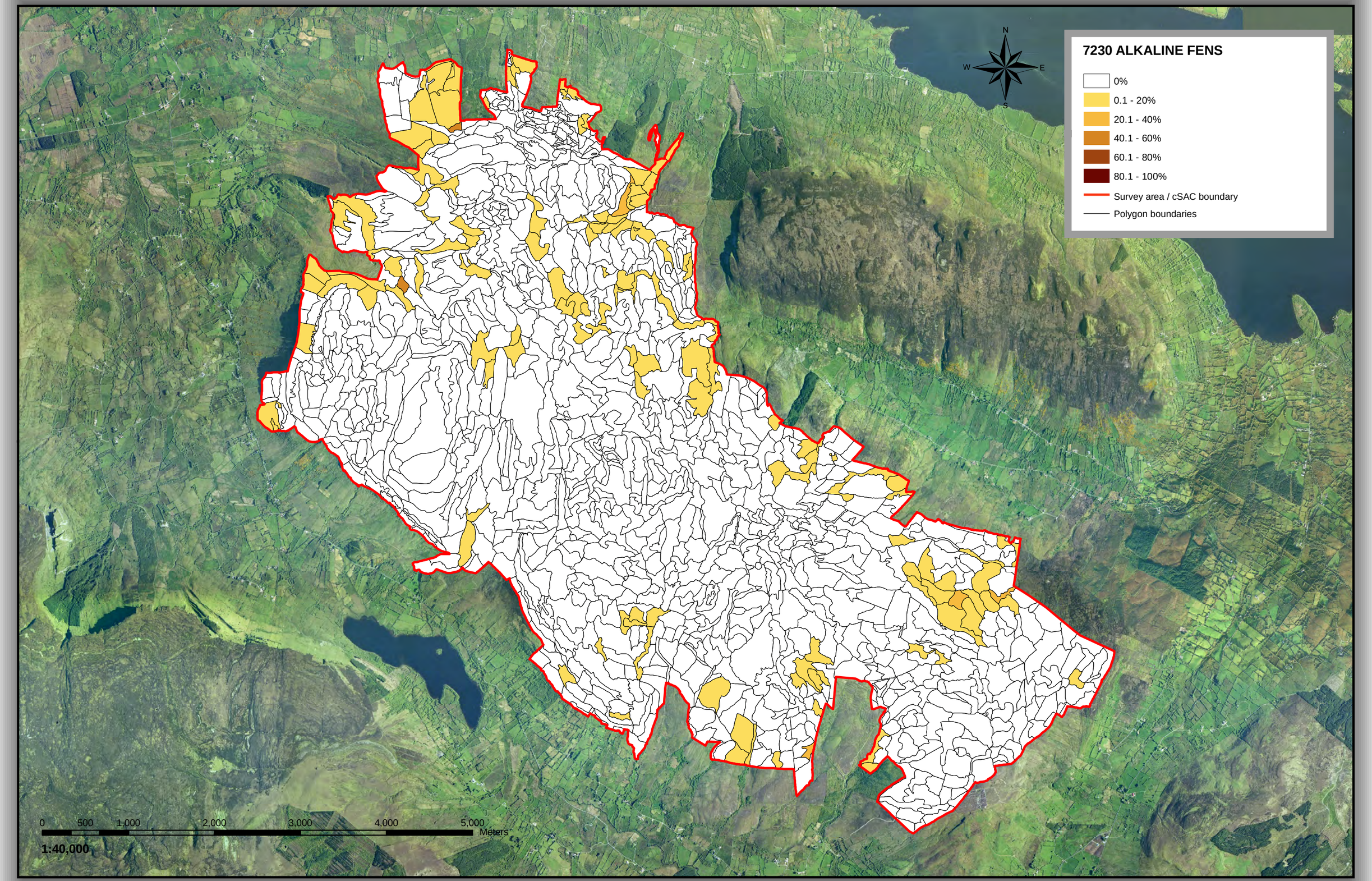

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Figure 4k. Cover of 8110 SILICEOUS SCREE within Arroo Mountain cSAC (001403), Co. Leitrim

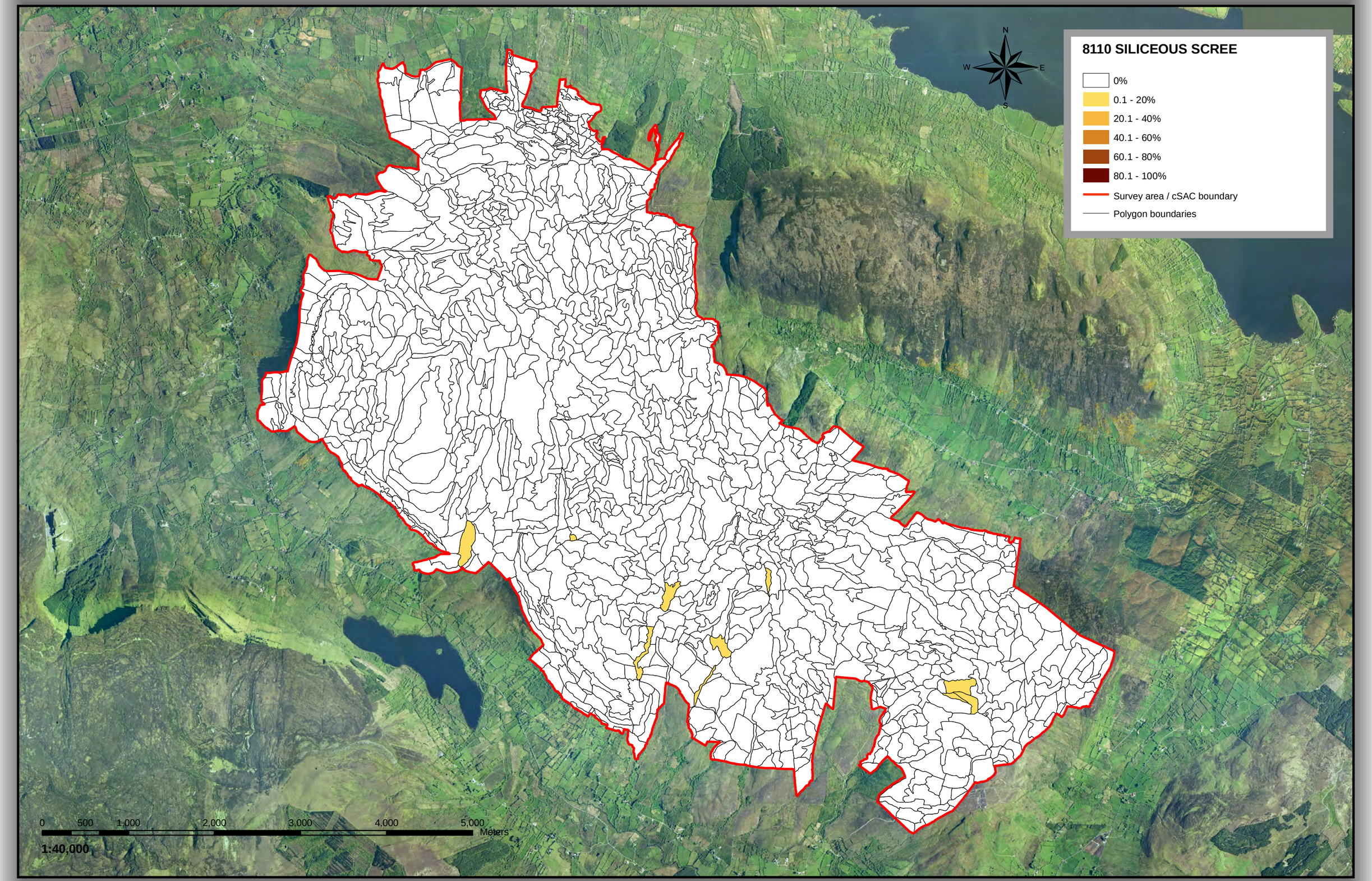

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Figure 4l. Cover of 8120 CALCAREOUS SCREE within Arroo Mountain cSAC (001403), Co. Leitrim

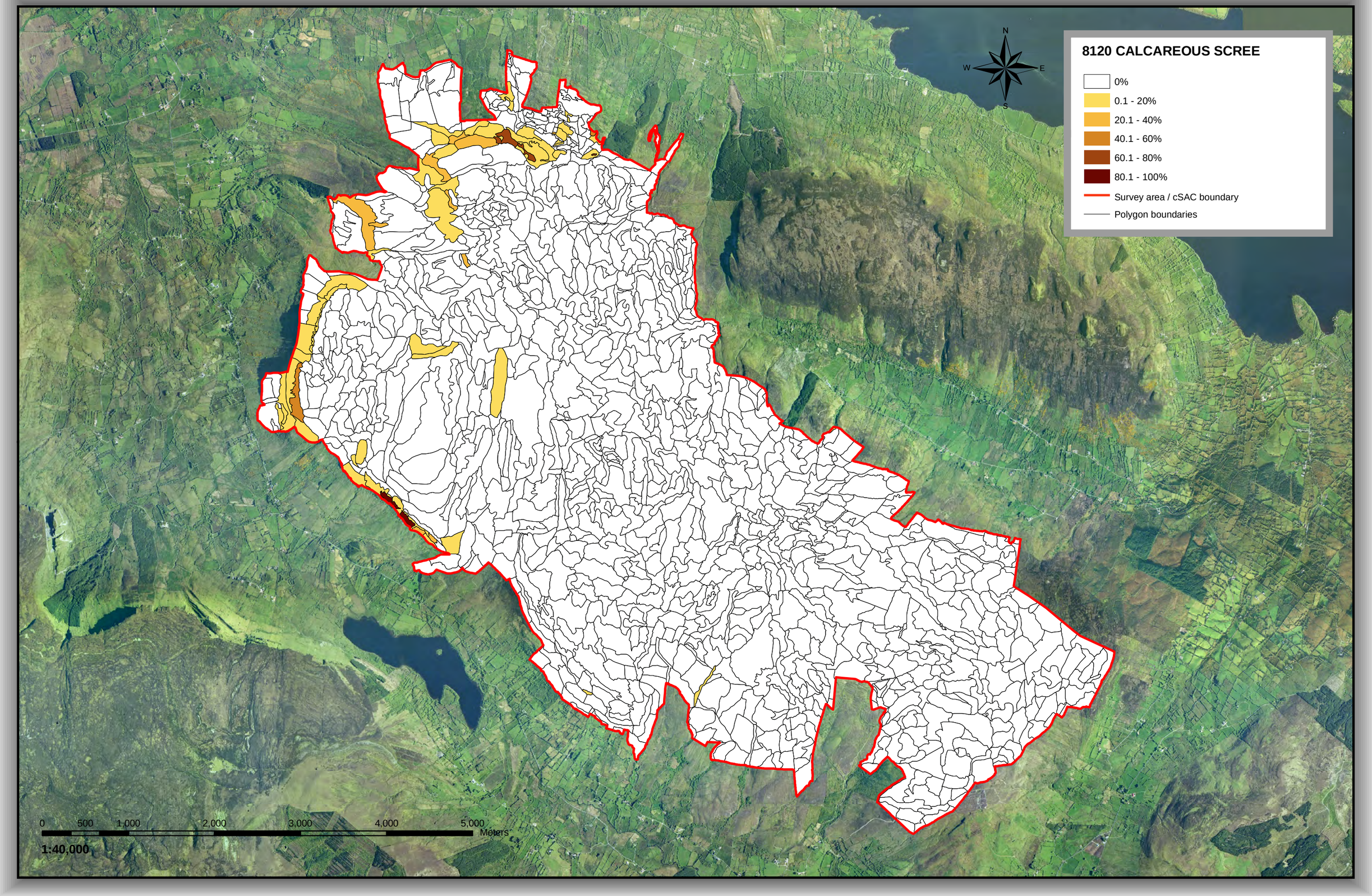

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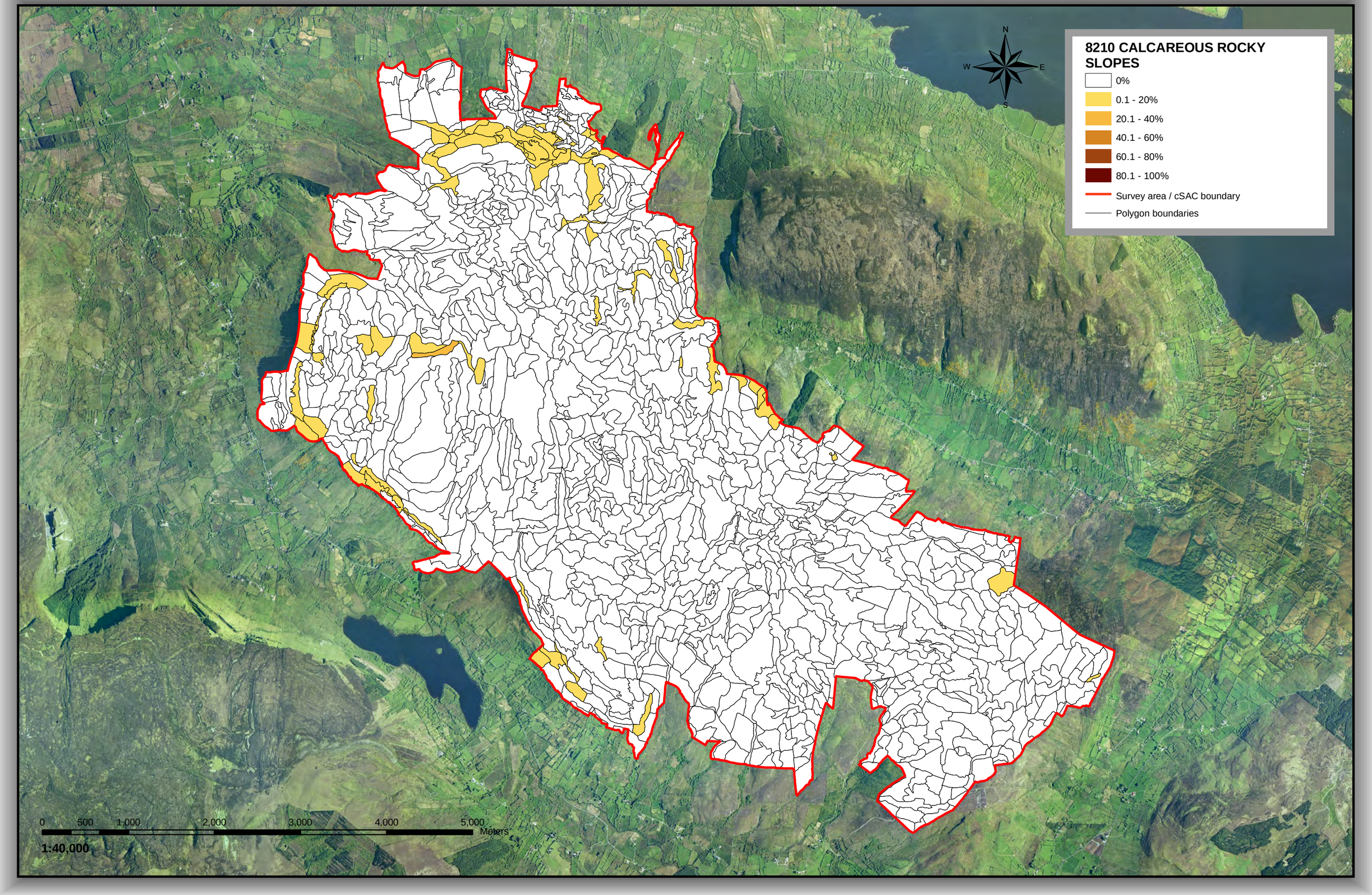
Figure 4m. Cover of 8210 CALCAREOUS ROCKY SLOPES within Arroo Mountain cSAC (001403), Co. Leitrim



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NSUH (Phase 3, 2012-2013) Site Report No. 12: Arroo Mountain cSAC (001403). Map size A3.

Figure 4n. Cover of 8220 SILICEOUS ROCKY SLOPES within Arroo Mountain cSAC (001403), Co. Leitrim

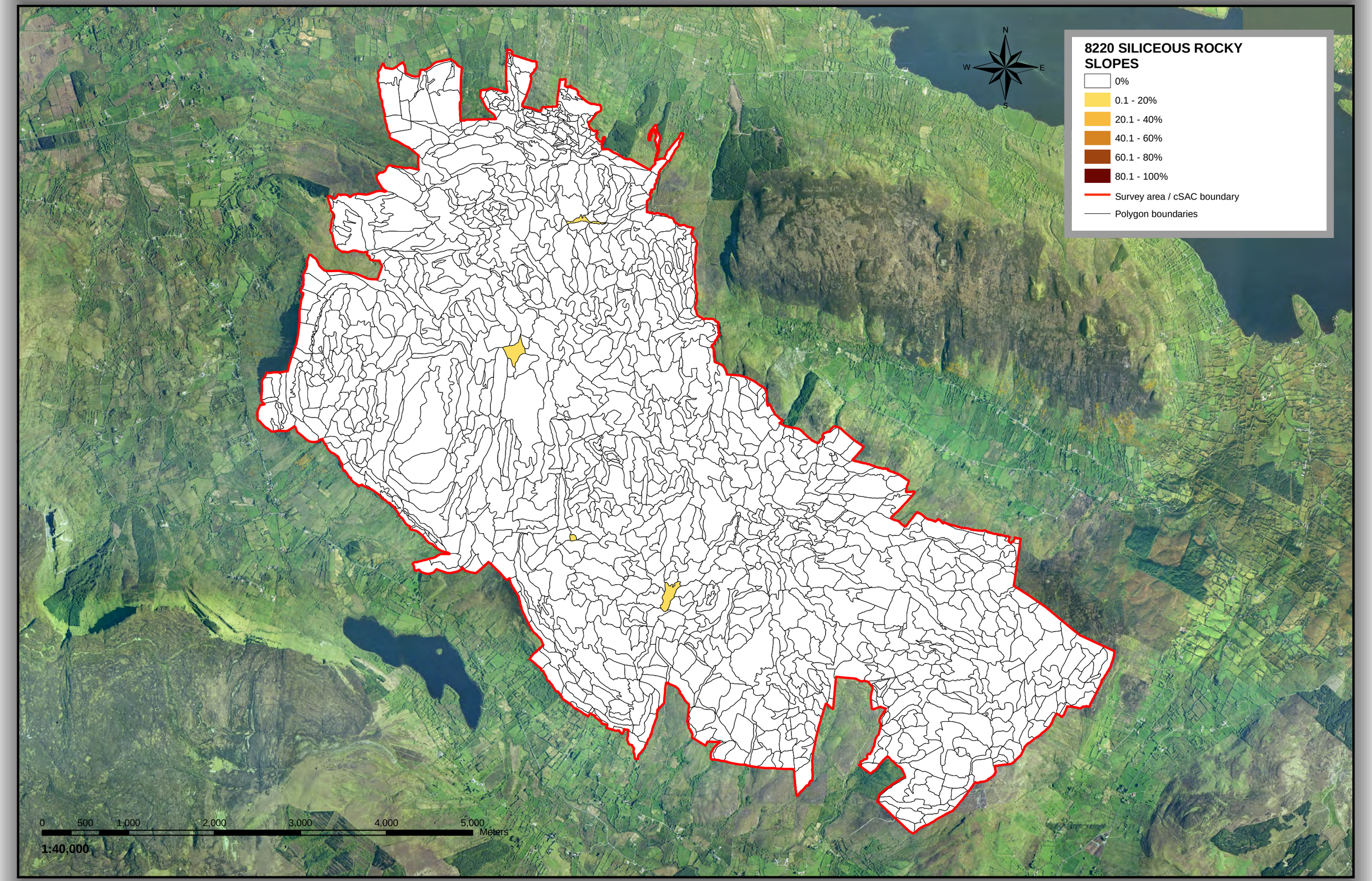

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Figure 5a. Location of rare and notable vascular plant records within and surrounding Arroo Mountain cSAC (001403), Co. Leitrim

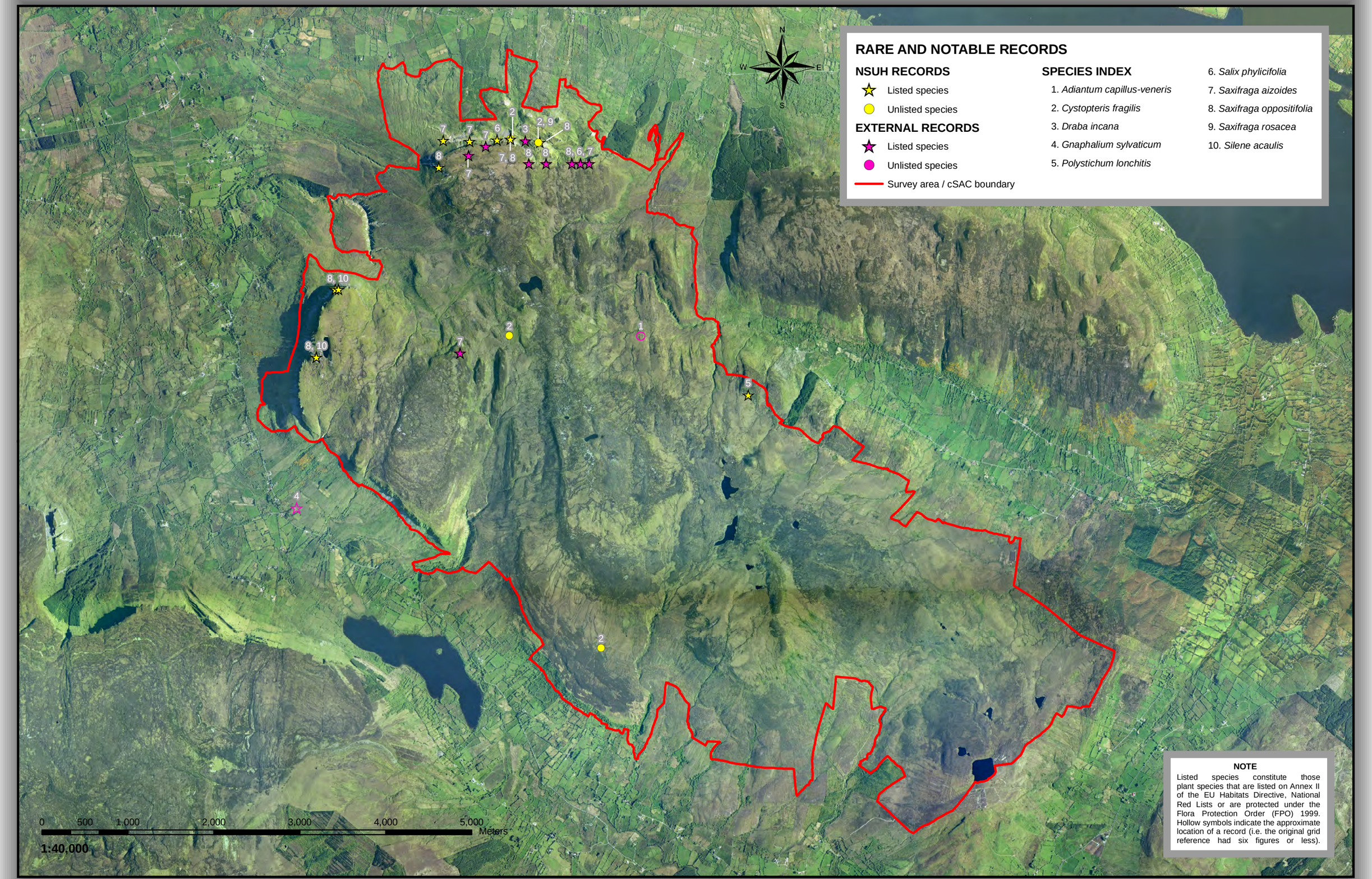

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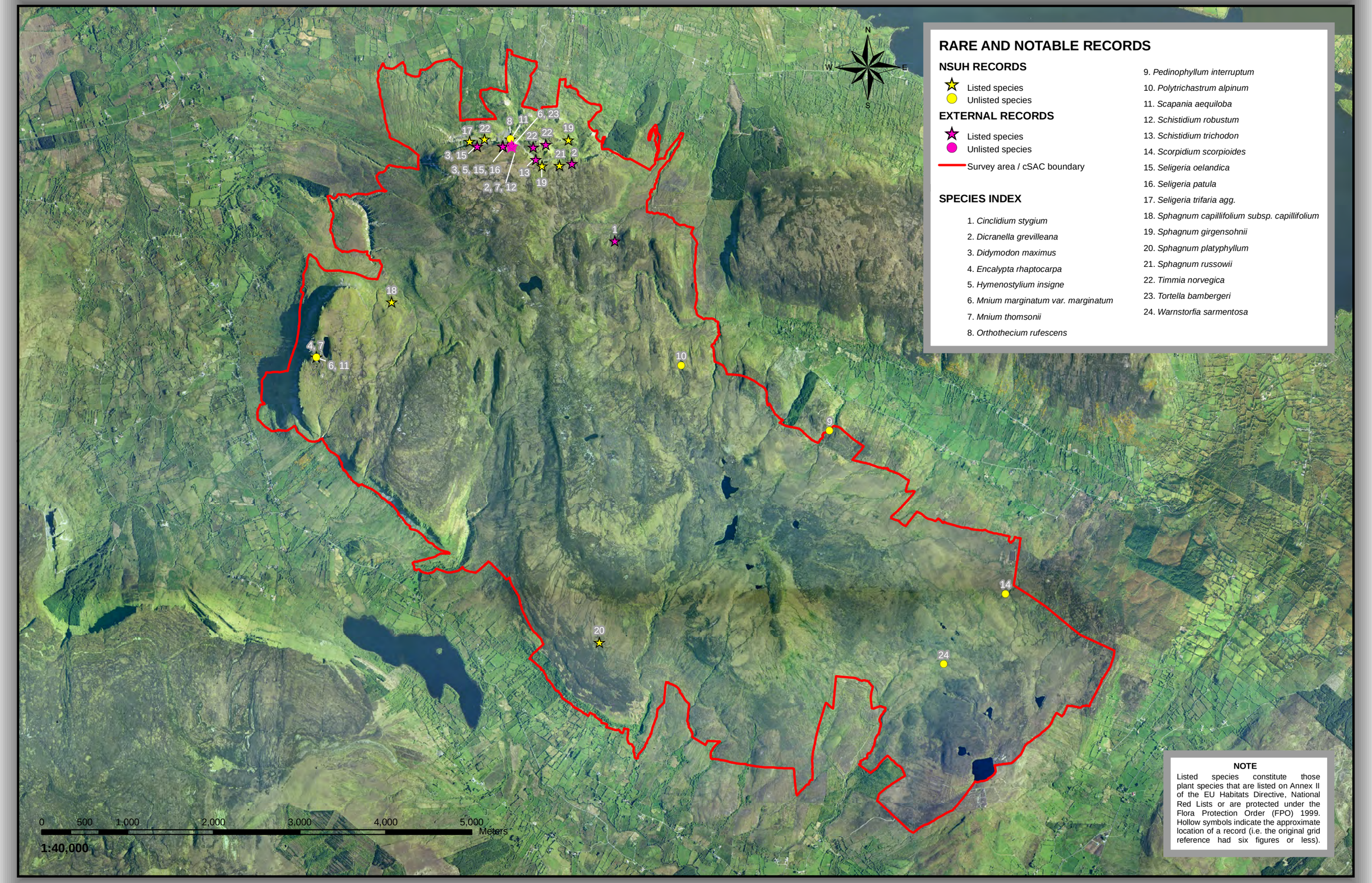
Figure 5b. Location of rare and notable bryophyte records within Arroo Mountain cSAC (001403), Co. Leitrim



RARE AND NOTABLE RECORDS

NSUH RECORDS

- Listed species
- Unlisted species

EXTERNAL RECORDS

- Listed species
- Unlisted species
- Survey area / cSAC boundary

SPECIES INDEX

1. *Cinclidium stygium*
2. *Dicranella grevilleana*
3. *Didymodon maximus*
4. *Encalypta rhaptocarpa*
5. *Hymenostylium insigne*
6. *Mnium marginatum var. marginatum*
7. *Mnium thomsonii*
8. *Orthothecium rufescens*
9. *Pedinophyllum interruptum*
10. *Polytrichastrum alpinum*
11. *Scapania aequiloba*
12. *Schistidium robustum*
13. *Schistidium trichodon*
14. *Scorpidium scorpioides*
15. *Seligeria oelandica*
16. *Seligeria patula*
17. *Seligeria trifaria agg.*
18. *Sphagnum capillifolium subsp. capillifolium*
19. *Sphagnum girgensohnii*
20. *Sphagnum platyphyllum*
21. *Sphagnum russowii*
22. *Timmia norvegica*
23. *Tortella bambergeri*
24. *Warnstorfia sarmentosa*

NOTE

Listed species constitute those plant species that are listed on Annex II of the EU Habitats Directive, National Red Lists or are protected under the Flora Protection Order (FPO) 1999. Hollow symbols indicate the approximate location of a record (i.e. the original grid reference had six figures or less).

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Figure 6. Location and results of conservation assessment monitoring stops and other relevés within Arroo Mountain cSAC (001403), Co. Leitrim

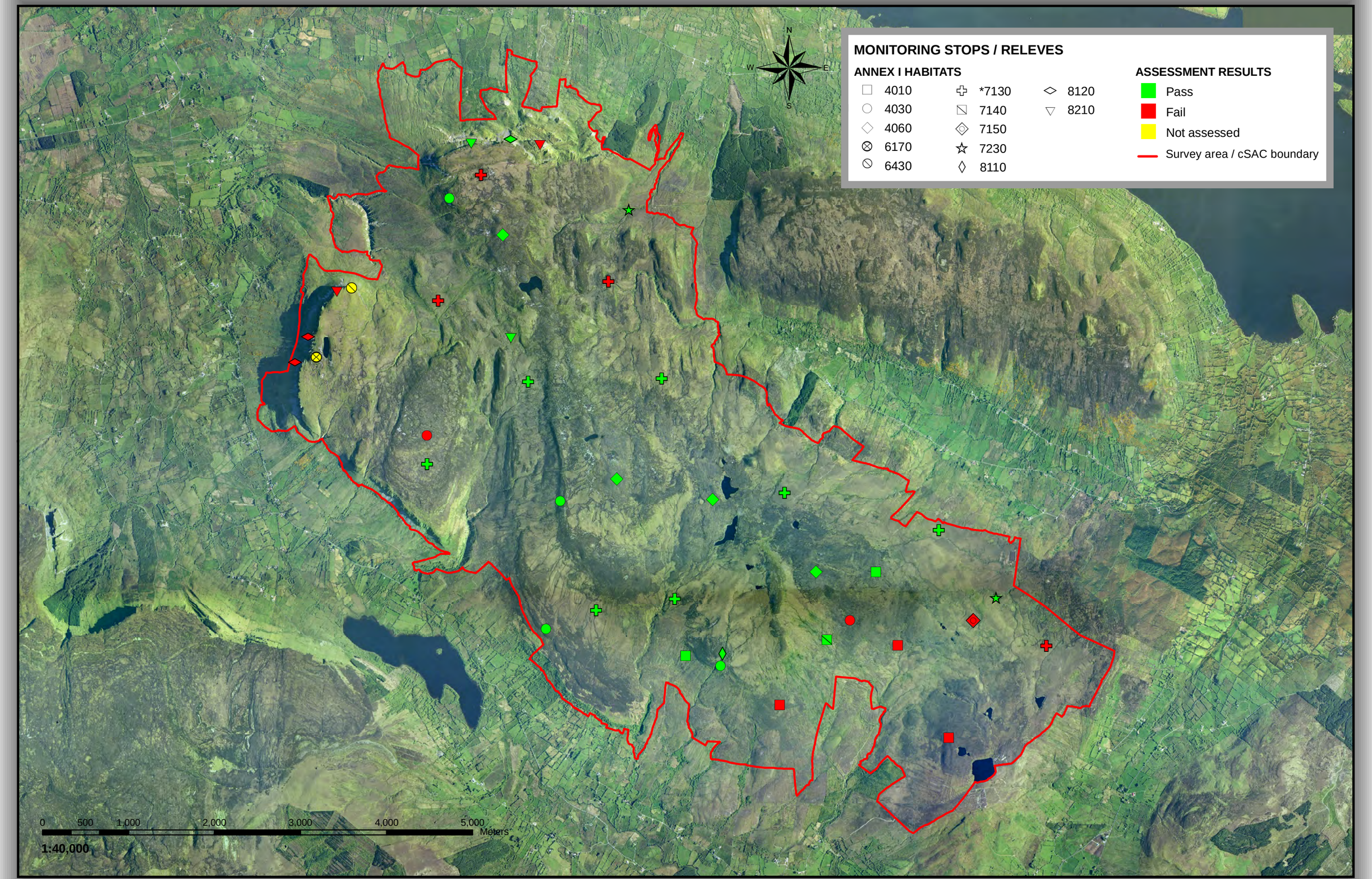

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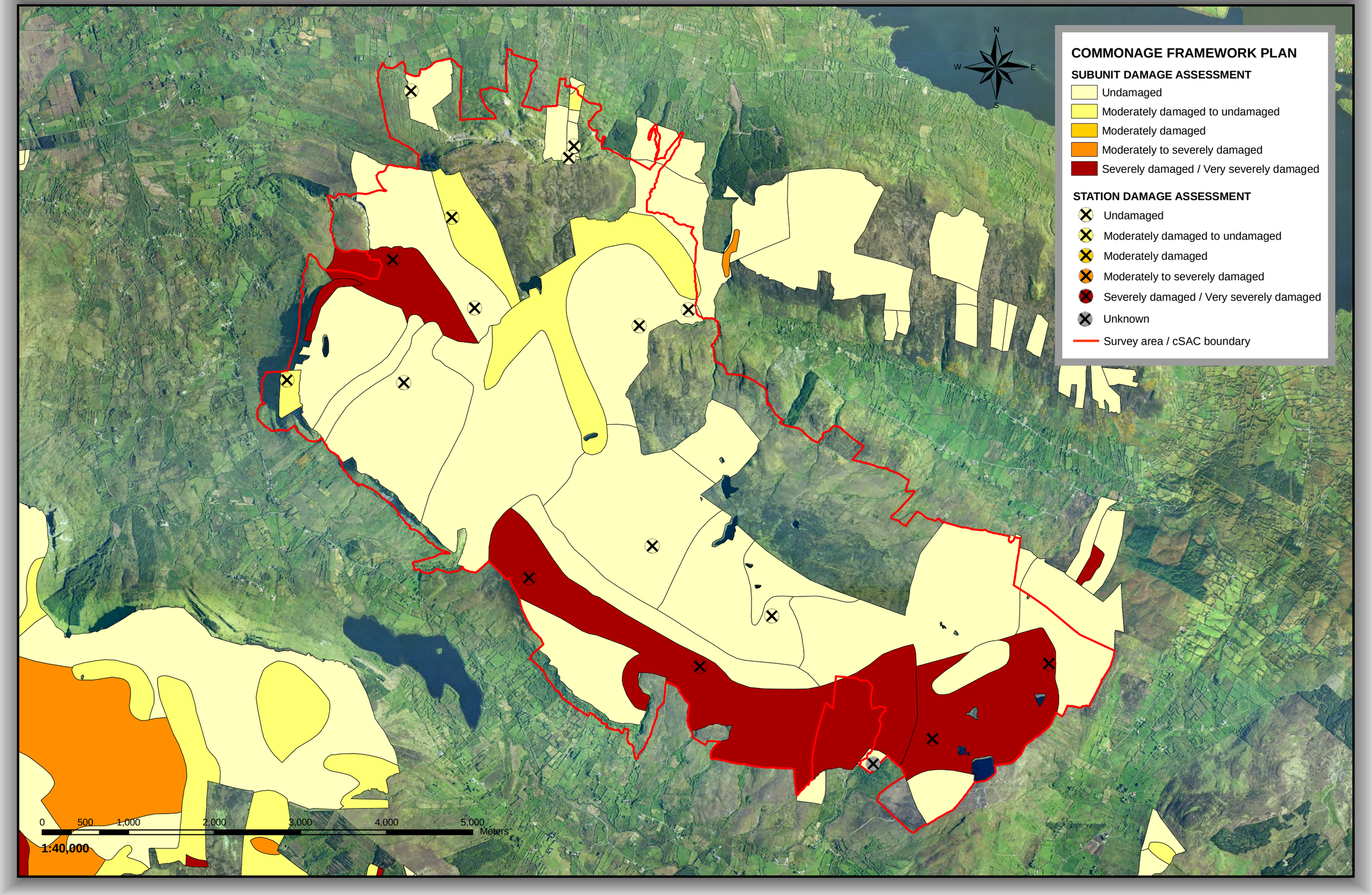
Figure 7. Commonage Framework Plan damage assessment (1999-2009) within and surrounding Arroo Mountain cSAC (001403), Co. Leitrim



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