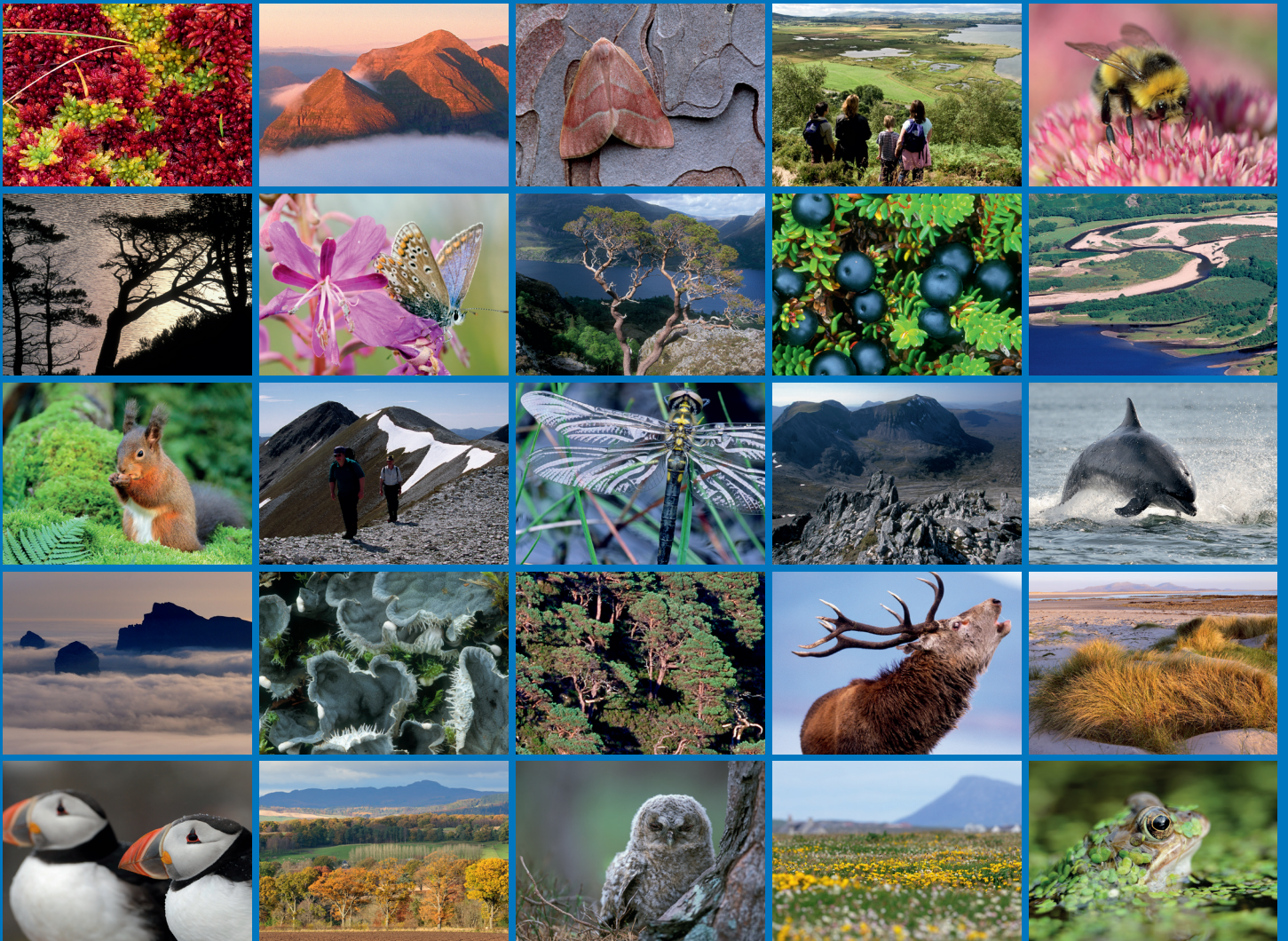


# Loch a' Mhuilinn SSSI (potential extension) – lichen survey 2014





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# RESEARCH REPORT

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**Research Report No. 1090**

## **Loch a' Mhuilinn SSSI (potential extension) – lichen survey 2014**

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## RESEARCH REPORT

# Summary

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### Loch a' Mhuilinn SSSI (potential extension) – lichen survey 2014

**Research Report No. 1090**  
**Project No: 113952**  
**Contractor: Andy Acton**  
**Year of publication: 2020**

#### Keywords

Loch a' Mhuilinn; lichen; survey; SSSI; potential extension; *Lobarion*; *Graphidion*; *Parmelion*

#### Background

Loch a' Mhuilinn Site of Special Scientific Interest (SSSI) lies on the north-west coast of Sutherland, 5 km south of Scourie. The site is of national importance for its mixed deciduous woodland, the exceptional woodland lichen flora and the assemblage of dragonfly species.

An extension to this SSSI has been suggested to the north and south and as far east as the A894. The aim of the survey was to identify the woodland lichen flora within the potential extension area.

#### Main findings

- This was a rapid survey geared at assessing the importance of the epiphytic lichen habitats in the potential SSSI extension.
- The survey area had small patches of three 'old woodland' epiphytic lichen communities that are typical of ancient woodland in western Scotland.
- The three communities were *Parmelietum laevigatae* (on birch and over bryophytes in rocky habitats), the *Lobarion pulmonariae* (on hazel, willow, rowan, aspen, rocky habitats and rarely on old birch) and oceanic forms of the *Graphidion scriptae* (on hazel, rowan and oak).
- These communities are typical lichen assemblages in 'ancient' native woodland in western and central Scotland.

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## **Acknowledgements**

Many thanks the landowner for access permission and to SNH staff Sue Agnew, Bob Bryson, Dave Genney and Sally Ward for help with preparation for fieldwork and of the report.

## 1. INTRODUCTION

### 1.1 Background

A potential extension has been suggested to Loch a' Mhuilinn Site of Special Scientific Interest (SSSI) (NC 166.394; VC 108 West-Sutherland). The British Lichen Society (BLS) assessed Loch a' Mhuilinn Wood, Sutherland, as of **Grade 2 National Importance** for lichens (Coppins, 2005) and Loch a' Mhuilinn SSSI is of special interest on account of its status as the most northern site in Britain with such well-developed *Lobarion* and *Graphidion* communities (Hope *et al.*, 2004).

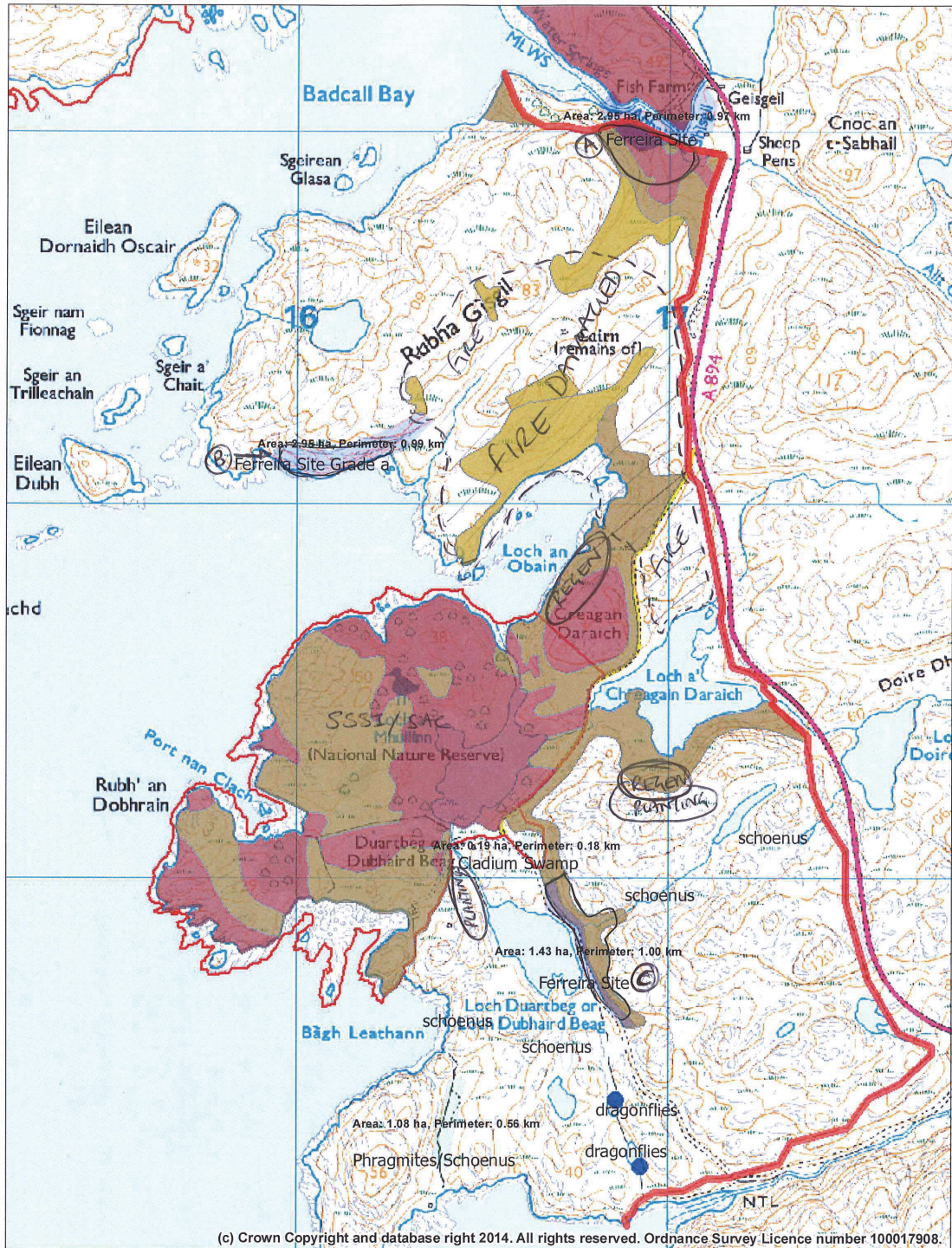
### 1.2 Study area

Chris Ferreira identified three main areas within the potential extension area that had remnant native woodland during his surveys in the 1980s (Ferreira, 1995). These areas are labelled A, B and C in Figure 1. SNH staff also suggested some areas with mature regeneration/planting that might be worth examining (see Figure 1). Ferreira's descriptions are given below:

**Ferreira A:** Abhainn Ghisgil woodland – wooded river side – Lewisian gneiss bedrock. W4/11 predominates with frequent eared willow and scattered hazel, aspen and oak. Also some herb poor *Betula* ground layer (W11b).

**Ferreira B:** Rubha Gisgil sub-maritime cliffs – SE facing sub-maritime Lewisian cliff, facing relatively sheltered bay. Chief feature is fine wind-pruned scrub hazel, oak and aspen (W9) that are flattened against the upper cliffs. Below the scrub there is a wide range of plant communities with a good development of herb rich *Calluna-Arctostaphylos* and *Calluna-Juniperus* heaths (H14c), herb rich *Calluna* heath (H10d) and *Brachypodium* grassland (W9b). There is a particularly large stand of *Luzula* tall fern community (U16a) surrounded by the *Teucrium* ledge community (W11a) and the *Polypodium-hypnoid* moss community (S17a).

**Ferreira C:** Loch Duartbeg Crag Woodland – rocks include hornblende bands within the Lewisian gneiss. On the SW facing crags aspen is present together with dwarfed wind-pruned oaks and with ivy covering considerable areas of the rock faces. Beneath the crags are H10d, CG10a and H16b. All the oaks on this site seem to be close to *Q. robur* with distinct leaf auricles and lacking stellate hairs on the leaf's lower surfaces, although on the other hand, the petioles are very long for *Q. robur*.



Notes: ""  
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0 0.05 0.1 0.2 0.3 0.4 km  
 Map produced using geo.View 3.0  
 Printed: Aug 14, 2014 16:01:45, Scale: 1:13044

Figure 1. Map provided by SNH showing the SSSI boundary (thin red line around the National Nature Reserve), the potential SSSI extension (thick red line) and the survey areas (areas labelled A, B, C and areas labelled with the words REGENERATION or PLANTING and circled in black pen).

## 2. METHODOLOGY

### 2.1 Field survey

The survey took the form of a rapid walkover survey of the study site in September 2014. Potential lichen habitats within the study site were briefly examined for conspicuous lichens, with a closer inspection where the lichen flora appeared particularly well developed. Survey effort concentrated on those epiphytic habitats likely to support notable species and well developed lichen communities e.g., old trees.

The locations of any conspicuous Nationally Rare, Nationally Scarce or Threatened (e.g. Red List) species that are readily identifiable in the field were recorded with a Garmin eTrex H Global Positioning System (GPS) but there was no systematic attempt to search for additional locations of any notable species found and no systematic attempt to quantify the frequency/abundance of species.

Samples were collected of species that were not readily identifiable to species level in the field for subsequent identification in the laboratory.

The lichen flora of SSSIs is monitored using a standard method that includes Indirect Monitoring of lichen habitats using Site Attribute Tables (SATs). SATs were completed for remnant native woodland in Ferreira Areas A and C.

### 2.2 Nomenclature

Nomenclature follows Smith *et al.* (2009). Lichen communities follow James *et al.* (1977). Conservation Status follows Woods & Coppins (2012) and a number of their acronyms for Conservation Status are used throughout this report. These include **DD** = Data Deficient; **E** = endemic; **IR** = species for which the UK has International Responsibility; **LC** = Least Concern (i.e. not threatened in GB though it may still be of conservation value); **NE** = Not evaluated, **NS** = Nationally Scarce, **NR** = Nationally Rare, **NT** = Near Threatened, **P** = UKBAP species; and **Sc** = Scottish Biodiversity List species. For explanations of these terms and other abbreviations refer to Appendices 1 and 2.

### 2.3 Constraints

This was rapid survey geared at assessing the importance of the epiphytic lichen habitats in the potential SSSI extension. It was not a full lichen survey and the focus was on 'old woodland' epiphytic species of three lichen communities that are typical of ancient woodland in western Scotland: the *Parmelietum laevigatae*, the *Lobarion pulmonariae* and oceanic forms of the *Graphidion scriptae*.



### 3. LICHEN HABITATS, COMMUNITIES AND SPECIES

The main epiphytic lichen habitats encountered were birch-oakwood, upland birchwood, stands of willow-birch carr and sea cliffs with oak-hazel and aspen. Additional interest included stands of aspen associated with inland crags and juniper on coastal rocks. The main epiphytic lichen communities of interest were the *Graphidion scriptae* (on hazel, rowan and oak), the *Lobarion pulmonariae* (on hazel, willow, rowan, aspen, rocky habitats and rarely on old birch), and the *Parmelietum laevigatae* (on birch and over bryophytes in rocky habitats).

The above communities are typical lichen assemblages in 'ancient' native woodland in western Scotland. These communities can support notable lichen species including species that are scarce, rare or threatened in Britain and/or Europe.

The survey areas and the lichen habitats, communities and species found within them are described discussed in sections 3.1-3.6

#### 3.1 Ferreira site A

Two main habitats were examined in this area. An area of willow carr and areas of remnant birch-oak woodland with scrubby regeneration of willow, birch, hazel and rowan. Some areas have been affected by the recent fires (including some dead young birch and willow regeneration). Two SATs have been completed for this area, one for each of the woodland types examined. The SATs describe the area and its lichen interest (see Annex 3). The lichen interest is summarised below.

##### 3.1.1 The birch-oak woodland

The *Parmelietum laevigatae* and *Lobarion pulmonariae* communities were recorded here. The *P. laevigatae* is generally poor on trees examined but includes some good patches of the old woodland indicator species *Parmeliella parvula* on birch. The *Lobarion* was recorded on willow, rowan and hazel. The *Lobarion* is best developed on older willows that appear to predate the recent regeneration but it is readily colonising young willow stems and has just started to colonise relatively recently established mature rowan and mature hazel. The *Lobarion* includes: *Pseudocyphellaria crocata* (on 6 willow stems c. NC16975 40950), *Sticta limbata*, *Pannaria rubiginosa*, *Lobaria scrobiculata*, *Nephroma laevigatum*, *Degelia atlantica*, *D. cyanoloma*, *D. plumbea* s. str., *Sticta fuliginosa*, *S. sylvatica* and *S. limbata*.

##### 3.1.2 Willow carr area

*Lobarion* well developed on old willow and readily colonising younger willow. The *Lobarion* included: *Pseudocyphellaria crocata* (a very healthy population, recorded on at least 21 stems c. NC 170 409), *Lobaria pulmonaria*, *L. scrobiculata*, *Pannaria rubiginosa*, *Peltigera praetextata*, *Degelia atlantica*, *D. plumbea* s. str., *Degelia cyanoloma*, *Nephroma laevigatum*, *Sticta limbata* and *S. sylvatica*.

#### 3.2 Ferreira site B

This site included patches of hazel, aspen oak scrub scattered along the sea cliffs (Figure 2). The trees are inaccessible and epiphytic lichen flora is not likely to be well-developed due to extreme exposure but the rocky crevices/gullies and associated trees could support *Lobarion* species. The *Lobarion* can sometimes be found on exposed sea cliffs in western Scotland and Ireland, and exposed maritime turf can support some notable maritime lichens (e.g. Acton *et al.*, 2014).

This coastal scrub is an interesting feature of site and possibly a useful seed source for habitat expansion onto adjacent ground. Some fire damage was noticed to the vegetation adjacent to the scrub, and possibly to the scrub habitat itself (though the dead branches seen appear to be dead due to exposure rather than fire).



Figure 2. Ferreira site B with some of the patches of coastal scrub indicated by the yellow arrows, as viewed from the shore at NC 16263 40081.

### 3.3 Ferreira site C

This area had birchwood with occasional oak. Most of birch trunks/stems are not particularly old with much young maturing regeneration along the old road, but there are some old birch, rowan and oak and a stand of aspen on the crags. One SAT has been completed for this area (see Annex 3). The SAT describes the area and its lichen interest in more detail than described below. The oceanic *Graphidion scriptae* and the *Lobarion pulmonariae* communities were recorded here.

The *Lobarion* was scarce but locally well developed on an oak, several rowans and several rocks. *Lobarion* species recorded included: *Biatora* (now *Mycobilimbia*) *epixanthoides*, *Pannaria rubiginosa*, *Parmeliella triptophylla*, the 'Scytonema' lichen, *Degelia plumbea* s. str, *Toninia plumbina*, *Sticta limbata*, *Sticta sylvatica*, *Megalaria grossa*, *Normandina pulchella*, *Lobaria scrobiculata*, *Leptogium cyanescens*, *Lobaria amplissima* (nice large patches). Other species recorded associated with the *Lobarion* on rocks include the RDB Near Threatened, Nationally Rare *Arctomia delicatula*, the RDB Near Threatened, Nationally Scarce BAP species *Jamesiella scotica*, *Massalongia carnosa* and what was tentatively identified as the Nationally Rare *Agonimia opuntiiella*.

The *Graphidion* was generally poor but the oceanic species *Pyrenula occidentalis* was recorded on an oak.

Ivy stems on crag by the maturing aspen at NC 16831 38681 supported *Toninia aromatica* and *Leptogium teretiusculum*; what was tentatively identified as *Vahliella atlantica* was recorded in crevices at base of aspen.

### 3.4 Birch stands along the southeast shore of Loch an Obain

Most of the stand examined (between c. NC 16893 40071 and 16893 40028) is young maturing birch. Prior to the recent pulse of regeneration there were probably just a few old birch, rowan and hazels associated with the crags. Juniper was also recorded here (on coastal rocks). The maturing regeneration supports little lichen interest as yet but a few older trees/shrubs support the *Parmelietum*, *Lobarion* and oceanic *Graphidion* communities.

A species-poor *Lobarion* was recorded on a rowan (possibly of phoenix origin) and on an old birch. *Lobarion* species include *Degelia cyanoloma* and *Lobaria pulmonaria*.

*Parmelietum laevigatae* species were recorded on rocks and old birch. Species recorded in the *Parmelietum* community included: *Ochrolechia androgyna*, *Sphaerophorus globosus* and the old woodland species *Dimerella lutea*, *Thelotrema lepadinum* and *Parmeliella parvula*. Two hazels were recorded with a well-developed (though species poor) *Graphidion* including *Pyrenula macrospora* and the oceanic species *P. occidentalis*.

Some more detailed information on this area is included in Annex 4.



Figure 3. Birch stands along the southeast shore of Loch an Obain between c. NC 16893 40071 and 16893 40028.



### 3.5 Maturing regeneration/planting to south of Loch a' Chreagain Daraich

Patches of birch-oakwood on crags and steep slopes including stands of remnant woodland and areas with regeneration/planting. Trees include old birch, oak, rowan (including veteran rowan) and a stand of aspen. The old trees and/or rocks support the *Parmelietum*, *Lobarion* and oceanic *Graphidion* communities. The *Lobarion* was locally well developed and recorded on block scree and rocky slabs, heather stems, old rowan and aspen. *Lobarion* species included: *L. pulmonaria* and *Degelia atlantica*, *D. cyanoloma* *D. plumbea* s. str., *Leptogium cyanescens* and *Protopannaria pezizoides*. A particularly healthy (and fertile) population of *L. pulmonaria* was recorded on the crags on bare rock (including on steep slabs in a distinctive *Luzula sylvatica*-*L. pulmonaria*-*Polypodium vulgare* community, Figure 5), on a dead fallen rotting tree, on mature rowans (and associated *Lonicera*) and on a mature aspen.

The *Parmelietum* was recorded on rocks and on an old dead fallen birch. *Parmelietum* species included *O. androgyna*, *Ochrolechia tartarea* and *S. globosus*. The *Parmelietum* could be well developed on any other old birch in this area.

The oceanic *Graphidion* species *P. occidentalis* was recorded on old and veteran rowan.

Other species of interest included the oceanic fern *Hymenophyllum wilsonii* on scree and rock slabs.

Some more detailed information on this area is included in Annex 4.



Figure 4. Old rowan at Chreagain Daraich with a well-developed Lobarion including abundant *Lobaria pulmonaria*.





*Figure 5. Steep slabs at Chreagain Daraich with a distinctive Luzula sylvatica-L. pulmonaria-Polypodium vulgare community. L. pulmonaria was also abundant on rowan and aspen here.*



Figure 6. Locally the *Lobarion* is well developed on heather stems at Chreagain Daraich (including small young thalli of *Degelia atlantica* and *L. pulmonaria*).

### 3.6 Maturing planted trees to northwest of Loch Duartbeg

This area has young established birchwood. The young maturing trees support common pioneer lichen species.

No old woodland *Lobarion* species were recorded as epiphytes but the *Lobarion* was recorded on a rock outcrop included *Pannaria rubiginosa*, *Leptogium lichenoides* and *Degelia atlantica*. These lichens should colonise the rowans as the trees mature. Two of the more mature rowans have 'mossy crotches' that support *Normandina pulchella* and *Normandina acroglypta* and this niche is perfect for colonisation by *Lobarion* species (Figure 8).

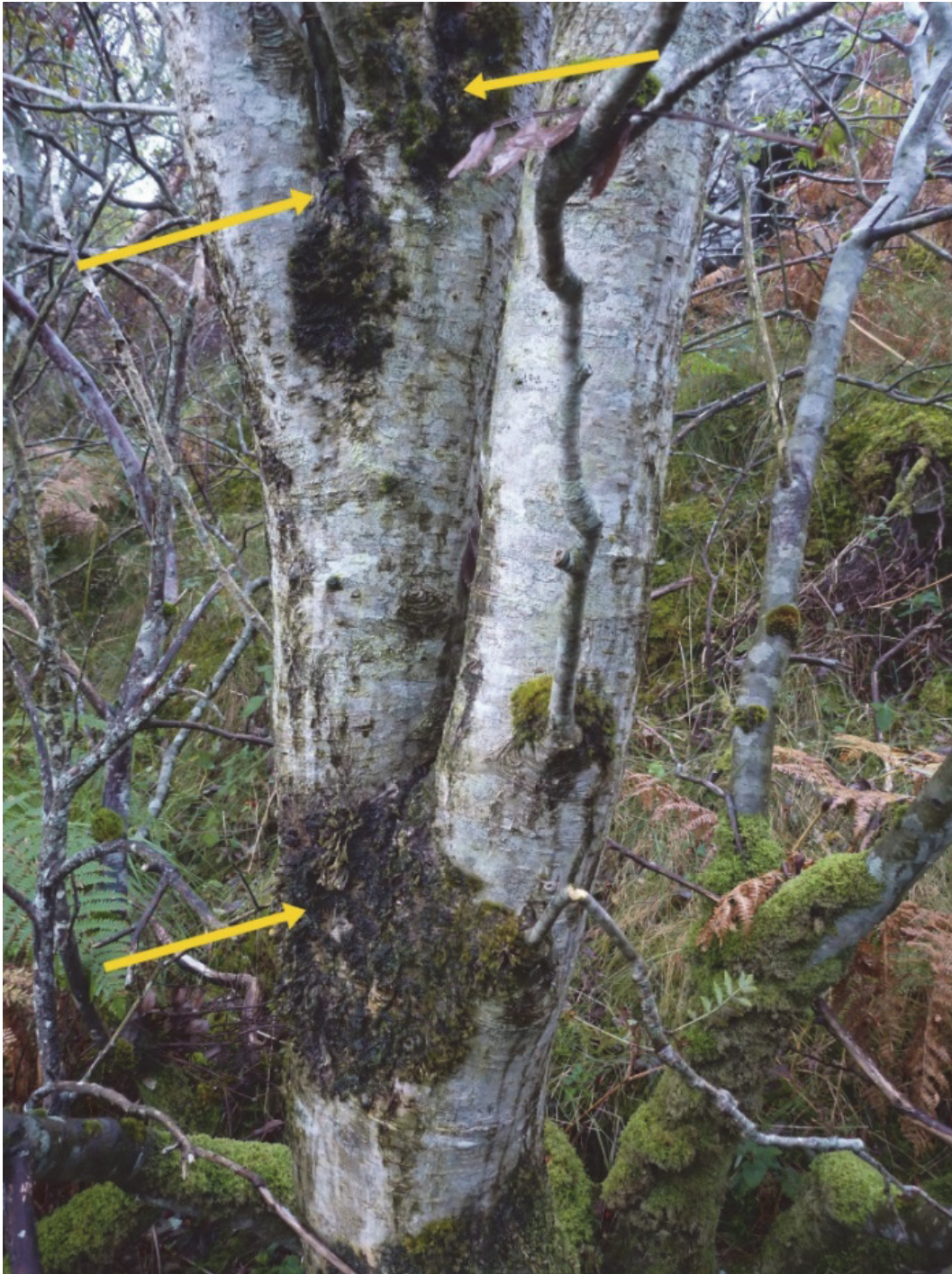
*Parmelietum* species were scarce but a mature birch supported a good patch of fertile *Megalania pulverea*. The outcrops and rocks here support small amounts of *Ochrolechia androgyna* and *Sphaerophorus globosus* which should hopefully colonise the maturing birch in this stand.

Some more detailed information on this area is included in Annex 4.





*Figure 7. Maturing planted trees to northwest of Loch Duartbeg.*



*Figure 8. Mossy patches on rowan associated with damp 'crotches' and seepage tracks are perfect for colonisation by Lobarion lichens. The 'proto-Lobarion' species Normandina pulchella and Normandina acroglypta were recorded in this niche.*



#### 4. EVALUATION OF THE LICHEN INTEREST

The main epiphytic lichen communities of interest were the *Graphidion scriptae* (on hazel, rowan and oak), the *Lobarion pulmonariae* (on hazel, willow, rowan, aspen, rocky habitats and rarely on old birch), and the *Parmelietum laevigatae* (on birch and over bryophytes in rocky habitats).

The above communities are typical lichen assemblages in ‘ancient’ native woodland in western and central Scotland. These communities can support notable lichen species including species that are scarce, rare or threatened in Britain and/or Europe.

Useful tools to help assess the ecological importance of epiphytic lichen habitats are the Regional Indices of Ecological Continuity (Coppins & Coppins, 2002). The study site includes the appropriate habitats, and lies near the border of the regions suitable for the application of the following indices:

- Western Scotland Index of Ecological Continuity (WSIEC)
- The Eu-Oceanic Calcifuge Index of Ecological Continuity (EUOCIEC)

##### 4.1 The West of Scotland Index of Ecological Continuity (WSIEC)

The WSIEC is used to assess the conservation importance of the epiphytic lichen habitats (primarily of less acid bark supporting the *Lobarion pulmonariae* and oceanic forms of the *Graphidion scriptae* but also including lichens on rocks in woodland habitats). Woodland with a WSIEC score of 25 or more is considered to be of high regional conservation importance (Coppins & Coppins, 2002). The WSIEC score for the woodland in the study site is 10 based on the presence of 5 main list WSIEC species (Coppins & Coppins, 2002) plus 5 WSIEC Bonus species (see Table 1).

##### WSIEC SCORE T = 10 (5+5)

The *Lobarion pulmonariae* and *Graphidion scriptae* communities are locally well developed but throughout much of the site are generally less luxuriant and less diverse. The *Lobarion* is less luxuriant and diverse than some more oceanic old woodlands further south but a lower score would be expected in woods this far north. The epiphytic lichens associated with this index add significantly to the biodiversity of the potential SSSI extension.

Table 1. Species recorded in *Lobarion* communities and *Graphidion* species indicating the WSIEC and Bonus WSIEC species recorded. Locations of species are listed in Appendices 3, 4.

BLS no.	Taxon name	Status	Record notes	WSIEC
0050	<i>Arctomia delicatula</i>	NT NR Sc		WSIEC Bonus
2449	<i>Agonimia opuntiella</i>	DD NR	Tentative id.	WSIEC Bonus
0146	<i>Biatora epixanthoides</i>	LC	Now <i>Mycobilimbia</i>	WSIEC
2540	<i>Degelia cyanoloma</i>	LC ?NS IR		
1029	<i>Degelia plumbea s. lat.</i>	LC IR		
1027	<i>Degelia atlantica</i>	LC IR		
0549	<i>Jamesiella scotica</i>	NT NS E P Sc IR		WSIEC Bonus
0834	<i>Leptogium cyanescens</i>	LC Sc IR		
0839	<i>Leptogium lichenoides</i>	LC		
0848	<i>Leptogium teretiusculum</i>	LC		
0855	<i>Lobaria amplissima</i>	LC Sc IR		WSIEC
0857	<i>Lobaria pulmonaria</i>	LC Sc IR		

0858	<i>Lobaria scrobiculata</i>	LC Sc IR		WSIEC
0861	<i>Massalongia carnosa</i>	LC		
0323	<i>Megalaria grossa</i>	LC		
0917	<i>Nephroma laevigatum</i>	LC Sc IR		
1835	<i>Normandina acroglypta</i>	LC		
0920	<i>Normandina pulchella</i>	LC		
0980	<i>Pannaria rubiginosa</i>	LC Sc IR		
1032	<i>Parmeliella triptophylla</i>	LC Sc IR		
1050	<i>Peltigera praetextata</i>	LC		
0979	<i>Protopannaria pezizoides</i>	LC		
1195	<i>Pseudocyphellaria crocata</i>	LC Sc IR		WSIEC
1225	<i>Pyrenula occidentalis</i>	LC Sc IR		WSIEC
1224	<i>Pyrenula macrospora</i>	LC		
1368	<i>Sticta limbata</i>	LC Sc IR		
1367	<i>Sticta fuliginosa</i>	LC Sc IR		
1369	<i>Sticta sylvatica</i>	LC Sc IR		
1907	<i>Toninia plumbina</i>	NT NR Sc		WSIEC Bonus
N/a	The 'Scytonema' lichen	NS?		WSIEC Bonus

#### 4.2 The Eu-Oceanic Calcifuge Index of Ecological Continuity (EUOCIEC)

The EUOCIEC is used to assess the conservation importance of the epiphytic lichen habitats associated with acidic bark (e.g. oak, birch, alder) in upland oceanic areas of Britain. Woodland with an EUOCIEC score of 10 or more is considered to be of high regional conservation importance (Coppins & Coppins, 2002). The EUOCIEC score for the woodland in the study site is 6 based on the presence of the EUOCIEC and EUOCIEC Bonus species listed in Table 2.

#### EUOCIEC SCORE T = 6 (3+3)

The epiphytic lichens associated with this index are generally poorly developed but do add to the biodiversity of the potential SSSI extension.

Table 2. Main list and Bonus EUOCIEC species recorded in the study site. Locations of species are listed in Appendices 3 and 4.

BLS no.	Taxon name	Status	ESIEC
0490	<i>Dimerella lutea</i>	LC	EUOCIEC Bonus
0318	<i>Megalaria pulverea</i>	LC	EUOCIEC
0921	<i>Ochrolechia androgyna</i>	LC	
0928	<i>Ochrolechia tartarea</i>	LC	EUOCIEC
1028	<i>Parmeliella parvula</i>	LC Sc IR	EUOCIEC Bonus
1333	<i>Sphaerophorus globosus</i>	LC	EUOCIEC
1410	<i>Thelotrema lepadinum</i>	LC	EUOCIEC Bonus

### 4.3 Notable lichens

Notable lichens recorded during the survey are summarised in Table 3.

Table 3. Notable taxa recorded in the study site. Locations of species are listed in Appendices 3 and 4.

BLS no.	Taxon name	Status	Record notes
2449	<i>Agonimia opuntiella</i>	DD NR	Tentative ID
0050	<i>Arctomia delicatula</i>	NT NR Sc	
1027	<i>Degelia atlantica</i>	LC IR	
2540	<i>Degelia cyanoloma</i>	LC ?NS IR	
1029	<i>Degelia plumbea s. lat.</i>	LC IR	
0549	<i>Jamesiella scotica</i>	NT NS E P Sc IR	
0834	<i>Leptogium cyanescens</i>	LC Sc IR	
0855	<i>Lobaria amplissima</i>	LC Sc IR	
0857	<i>Lobaria pulmonaria</i>	LC Sc IR	
0858	<i>Lobaria scrobiculata</i>	LC Sc IR	
0917	<i>Nephroma laevigatum</i>	LC Sc IR	
0980	<i>Pannaria rubiginosa</i>	LC Sc IR	
1028	<i>Parmeliella parvula</i>	LC Sc IR	
1032	<i>Parmeliella triptophylla</i>	LC Sc IR	
1195	<i>Pseudocyphellaria crocata</i>	LC Sc IR	
1225	<i>Pyrenula occidentalis</i>	LC Sc IR	
1367	<i>Sticta fuliginosa</i>	LC Sc IR	
1368	<i>Sticta limbata</i>	LC Sc IR	
1369	<i>Sticta sylvatica</i>	LC Sc IR	
N/a	The 'Scytonema' lichen	NS?	
1907	<i>Toninia plumbina</i>	NT NR Sc	
2432	<i>Vahliella atlantica</i>	LC NR	Tentative ID

## 5. DISCUSSION

None of the *Graphidion*, *Lobarion* or *Parmelietum* communities in the potential SSSI extension are intrinsically of very high conservation interest and this is reflected in the WSIEC and EUOCIEC scores. However, there are features of the potential extension area that mean the extension would add to the conservation interest of the SSSI:

- Although no particularly species-rich examples of the community were recorded, the *Lobarion* is locally well-developed in Areas A, C and at Chreagain Daraich on old willow and rowan (more rarely on hazel, *Calluna* and mossy rocks).
- The populations of *Pseudocyphellaria crocata* in Area A are better than those known from within the SSSI.
- Area C includes some healthy patches of *L. amplissima*. Coppins & Coppins (2010) set up monitoring for this species on the SSSI and state that this is a notable species for this region (due to geographical location, isolation from other nearby populations).
- Several notable species were recorded in Area C that are not known from the SSSI: *Gyalideopsis scotica*, *Toninia plumbina* and what was tentatively identified as *Agonimia opuntiella*. The 'Scytonema' lichen is an undescribed lichen that is most often recorded associated with Ancient woodlands. The *Dictyonema* sp. recorded in the SSSI by Coppins in 2004 (Hope *et al.*, 2004) is likely to be a collection of the 'Scytonema' lichen. *Arctomia delicatula* was previously recorded from Loch a' Mhuilinn woodland but it is unclear whether this was from the current SSSI area.
- Areas A, B, C and the crags at Chreagain Daraich have stands of aspen.
- Areas A, B, C and the crags at Chreagain Daraich have oak (though it is rare in Area C and at Chreagain Daraich). The oaks at Loch a' Mhuilinn represent the most northern remnant of native oak woodland in the British Isles and the stands in the potential extension area are important outliers to the main stands of oak in the SSSI.
- The potential extension area has some pockets of hazel. Hazel (a good phorophyte for both *Lobarion* and oceanic *Graphidion* species) is quite local in the SSSI. There are two old/mature hazels along Loch an Obain and hazel in Area B. Hazel has successfully regenerated in area A (and is being colonised by *Lobarion* lichens).
- Most of the successful natural regeneration/planting is birch and willow with some rowan. The birch will become suitable for the *Parmelietum* as it ages and the willow and rowan will hopefully become suitable for the *Lobarion*.

Table 4 compares the numbers of WSIEC and WSIEC Bonus species recorded within the SSSI and within the potential extension area. Based on the results in Table 4, and the presence of a well-developed *Lobarion* (especially the good populations of *P. crocata* in Area A, and *L. amplissima* in Area C), it is clear that the woodland in Areas A, C and at Chreagain Daraich would be the most worthwhile to include in any extension to the SSSI. The other two areas with recent planting/regeneration are currently less interesting for lichens at but they provide additional epiphytic lichen habitat and the trees/shrubs here will probably develop a more interesting lichen flora as the stands age.



Table 4. WSIEC species recorded from Loch a' Mhuilinn SSSI and in the potential SSSI extension. This Table is based on Table 6 in Coppins & Coppins (2010). Species listed in bold have only been recorded in the potential extension area, not the current SSSI.

Species listed on the West of Scotland Index of Ecological Continuity	previously recorded	recorded 2004	recorded 2010	Recorded in 2014 within the potential extension area
<i>Arthonia ilicina</i>	+			
<i>Biatora epixanthoides</i>		+		Area C
<i>Collema subflaccidum</i>	+	+	+	
<i>Gomphillus calycioides</i>	+			
<i>Hypotrachyna taylorensis</i>	+	+		
<i>Leptogium burgessii</i>	+			
<i>Lobaria amplissima</i>	+	+	+	Area C
<i>Lobaria scrobiculata</i>	+	+	+	Area A, C
<i>Lopadium disciforme</i>	+			
<i>Parmeliella testacea</i>	+			
<i>Peltigera collina</i>	+			
<i>Pseudocyphellaria crocata</i>	+	+	+	Area A
<i>Pseudocyphellaria norvegica</i>	+	+	+	
<i>Pyrenula laevigata</i>	+			
<i>Pyrenula occidentalis</i>	+	+	+	Area B, C
<i>Sticta canariensis</i>	+			
<i>Thelotrema macrosporum</i>	+	+	+	
<i>Thelotrema petraetoides</i>	+	+		
<b>Bonus species</b>				
<b><i>Agonimia opuntiella</i></b>				Area C
<i>Arctomia delicatula</i>	*			Area C
<b><i>Gyalideopsis scotica</i></b>				Area C
The 'Scytonema' lichen		**		Area C
<b><i>Toninia plumbina</i></b>				Area C
	<b>17 (+ 1)</b>	<b>10 (+1)</b>	<b>7</b>	<b>10 (5+5)</b>

\* Previously recorded in the woodland at Loch a' Mhuilinn but unclear if recorded from within the SSSI.

\*\* Probably recorded in 2004 (as *Dictyonema* sp.)

## 6. REFERENCES

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## ANNEX 1: GLOSSARY OF ECOLOGICAL TERMS

<b>Assemblage</b>	The lichen assemblage at a location refers to the lichen communities and lichen species present.
<b>Avoidance measures</b>	Measures taken to avoid adverse ecological impacts, such as locating the main development and its working areas and access routes away from areas of high ecological interest, fencing off sensitive areas during the construction period, or timing works to avoid sensitive periods. Also includes alternative and 'do nothing' options.
<b>Biodiversity</b>	The total range of variability among systems and organisms at the following levels of organisation: bioregional, landscape, ecosystem, habitat, communities, species, populations, individuals, genes and the structural and functional relationships within and between these different levels.
<b>Bryicolous</b>	Growing on bryophytes (mosses or liverworts).
<b>Community</b>	A group of species characteristically found in the same location due to the similarity of their habitat or micro-habitat requirements.
<b>Corticolous</b>	Growing on bark.
<b>Critically Endangered</b>	An IUCN Red List category for a taxon that is considered to be facing a high risk of extinction, according to IUCN criteria.
<b>Data Deficient</b>	A taxon is considered Data deficient when there is insufficient data to assign a IUCN Red List category, but there is a significant possibility that the taxon may be threatened
<b>Direct impact</b>	An outcome that is directly attributable to a defined action.
<b>Disturbance</b>	Any event that alters or stresses an environment's structure and/or function.
<b>Ecological continuity</b>	Habitats with a high degree of ecological continuity are those which have existed in a more natural state for longer. For example, ancient woodland.
<b>Ecological impacts</b>	Result from the biophysical or environmental changes that occur as a result of the development activities.
<b>Epiphytic</b>	Growing on other plants (generally on trees in this report) for mechanical support (and not parasitic).
<b>Fragmentation</b>	The breaking up of a habitat, ecosystem, or land-use type into smaller parcels. Fragmentation results in the change in the physical environment within the parcels (e.g. in humidity and light regimes) and in biogeographic changes (e.g. in isolation and connectivity), which have important consequences for biota.

<b>Habitat</b>	A place in which a particular plant or animal lives. Often used in the wider sense referring to major assemblages of plants and animals found together.
<b>Index of ecological continuity</b>	A measurement of ecological continuity based on the presence of certain indicator species that are generally poor colonisers of new habitats and seem to require ecological continuity.
<b>Integrity of a species (or an assemblage of species)</b>	The coherence of the ecological structure of the population or group that enables it to maintain the numbers and functionality for which it was identified as a valued ecological receptor.
<b>International Responsibility status</b>	In this report, this category only applies to lichen species. British populations of lichens with International Responsibility are considered to be of international significance. Woods & Coppins (2012) estimate that Britain supports more than 10% of the European and/or world's population of these species. Many of these species are member of the <i>Lobarion pulmonariae</i> lichen community.
<b>Least Concern</b>	An IUCN Red List category for a taxon that has been evaluated against the IUCN criteria but does not qualify for Critically Endangered, Endangered, or Vulnerable. The category also excludes Near Threatened species (see below). This category includes species that are widespread and abundant but can also include species that are of conservation value. For example a species listed as LC may be of regional, local or very local (site-based) conservation value.
<b>Lichenicolous</b>	Growing on lichens.
<b>Lignicolous</b>	Growing on deadwood (lignum).
<b>Mitigation</b>	Measures taken to reduce adverse impacts e.g. modifications or additions to the design of the development.
<b>Nationally Rare</b>	Occurring in 15 or fewer hectads (10 x 10 km squares) in Great Britain.
<b>Nationally Scarce Near Threatened</b>	Occurring in 16-100 hectads (10 x 10 km squares) in Great Britain. A taxon that is Near Threatened has been evaluated against the IUCN Red List criteria but does not qualify for Red List Threatened categories (i.e. is not Critically Endangered, Endangered or Vulnerable) at the moment, but is close to qualifying for or is likely to qualify for a threatened category in the near future (follows Woods & Coppins, 2012).
<b>Non-lichenized fungi</b>	A fungus that has been traditionally recorded by lichenologists but is not strictly a lichen as it has no photobiont (algal partner).
<b>Not Evaluated</b>	A taxon is Not Evaluated when it has not been assessed against IUCN criteria.
<b>Oceanic</b>	Species with a 'western' distribution occurring in western Europe extending east to Norway, Denmark and Central France.

<b>Old woodland indicator</b>	Species which are poor colonisers of new woodland habitats and so tend to be associated with long-established or ancient woodland.
<b>Population</b>	A collection of individuals (plants or animals), all of the same species and in a defined geographical area.
<b>Priority Habitat</b>	These are habitats for which a Species Action Plan has been agreed under the UK BAP (or LBAP) because they have been assessed to be in a sub-optimal state. It does not necessarily imply they are of particular conservation importance.
<b>Priority Species</b>	Species for which Species Action Plan has been agreed under the UK BAP (or LBAP) because they have been assessed to be in a sub-optimal state. It does not necessarily imply they are of particular conservation importance.
<b>Red List species</b>	A taxon that has been evaluated against IUCN criteria and qualifies as threatened (Critically Endangered, Endangered, or Vulnerable).
<b>Restoration</b>	The re-establishment of a damaged or degraded system or habitat to a close approximation of its pre-degraded condition.
<b>Schedule 8</b>	Species protected by law under Schedule 8 of the Wildlife and Countryside Act 1981(as amended).
<b>Saxicolous</b>	Growing on rock.
<b>Semi-natural</b>	Vegetation which has been modified by humans but is still of significant nature conservation interest because it is composed of native plant species, is similar in structure to natural types and supports native animal communities.
<b>Species</b>	A group of organisms of the same kind which reproduce amongst themselves but are usually reproductively isolated from other groups of organisms.
<b>Species richness</b>	The number of species in an area or a sample.
<b>Terricolous</b>	Growing on the ground. Includes those species growing on soils, decaying vegetation, and low mats of bryophytes and occasionally spreading to overgrow the bases of vegetation at ground level.
<b>Viability</b>	Given that the intrinsic quality of the vegetation in the habitat is acceptable, its area must be large enough to be viable so that the habitat and its flora and fauna can resist edge effects, and the loss of species and/or colonisation by inappropriate species.
<b>Vulnerable</b>	An IUCN Red List category for a taxon that is considered to be facing a high risk of extinction, according to IUCN criteria.

## **ANNEX 2: ABBREVIATIONS USED IN THE TEXT**

BAP	Biodiversity Action Plan
BLS	British Lichen Society
CR	Critically Endangered (An IUCN Red List category)
DD	Data Deficient (as defined by Woods & Coppins, 2012)
LBAP	Local Biodiversity Action Plan
EUOCIEC	EU-Oceanic Index of Ecological Continuity
IR	International Responsibility (as defined by Woods & Coppins, 2012)
IUCN	International Union for the Conservation of Nature and natural resources
JNCC	Joint Nature Conservation Committee.
LC	Least Concern (as defined by Woods & Coppins, 2012)
NCI	Nature Conservation Importance
NE	Not Evaluated according to IUCN Red List criteria
NR	Nationally Rare
NS	Nationally Scarce
NT	Near Threatened (as defined by Woods & Coppins, 2012)
NVC	National Vegetation Classification
S8	Schedule 8 species
SAC	Special Area of Conservation
SAP	Species Action Plan
SNH	Scottish Natural Heritage
SSSI	Site of Special Scientific Interest
VU	Vulnerable (An IUCN Red List category)
UK BAP	United Kingdom Biodiversity Action Plan
WSIEC	West of Scotland Index of Ecological Continuity



### ANNEX 3: SITE ATTRIBUTE TABLES (SATs)

Table 5. Ferreira site A, c. NC 16975 40950. Site Attribute Table for Indirect Monitoring (IMP) – Oceanic scrubby oak, or oak-birch woodlands.

Patches of remnant woodland with scrubby regeneration of willow, birch, hazel and rowan. Some areas affected by the recent fires (including some dead young birch and willow regeneration) but this does not appear to have adversely affected the existing lichen interest.

Name of recorder: Andy Acton

date: 26.09.14

weather: dry, windy

Lichen habitat	Attribute	Target	Measure	Results	Target met
Oceanic scrubby oak, or oak-birch woodlands	extent	No loss of area of woodland	Visual assessment (mapping/aerial photographs)	Recent habitat expansion	Baseline
Oceanic scrubby oak, or oak-birch woodlands	Stand structure	Maintain at least a 20–70% canopy cover	Mosaics of open and closed canopy	Scattered patches of mature trees with patchy regeneration, mostly low scrubby canopy c. 3.5 -5m with canopy >80%.	Baseline
Oceanic scrubby oak, or oak-birch woodlands	Range of tree and shrub species present – unlikely to be very varied, with perhaps birch the most frequent (or even dominant) component in the stand, with rowan, etc.	Maintain the range of phorophytes to ensure continuation of habitat and niches for the species-rich lichen flora	Visual assessment; look for (and record) the typical relationship between the dominant oak, with birch and perhaps rowan, aspen, hazel and holly	Willow (F, young thicket in most of area but includes at least some old/mature), rowan (F, mostly young mature regeneration), young hazel (O), birch (F-LA all trees examined were young mature, but some older trees might be present elsewhere), oak (R).	Baseline
Oceanic scrubby oak, or oak-birch woodlands	Freedom from rhododendron	No rhododendron	Visual assessment	None seen	Y

Lichen habitat	Attribute	Target	Measure	Results	Target met
Oceanic scrubby oak, or oak-birch woodlands	Freedom from exotic regeneration	No exotic regeneration	Visual assessment	None seen	Y
Oceanic scrubby oak, or oak-birch woodlands	Occasional light grazing	A balance between no grazing and over-grazing. A mosaic of glades and closed tree canopy to be maintained, retaining diversity of light/shade, humid and well-ventilated conditions around trees and rocks. No more than 10% ivy and/or bramble present.	Visual assessment; look for evidence of ivy being browsed, glades kept open; ivy or bramble not choking glades or covering boulders or rock outcrops; look for evidence of regeneration of trees and shrubs, is there evidence of thicket regeneration developing	<p>Enough young birch, rowan, hazel and willow have established to ensure continuity so no more required (more might threaten gladed areas).</p> <p>Browsing levels are low overall but palatable species are targeted. All hazels seen with basal stems heavily browsed and suppressed (includes evidence of current browsing). Multi-stemmed hazels have no current successful sun shoots but several established stems so are ok for now. Some young mature hazels with a single large stem had several younger dead stems (due to past bark stripping/ ring barking); these may develop into old 'tree form' hazels if no basal regeneration establishes.</p> <p>Some old bark striping on rowans.</p> <p>No regeneration of oak or young oak seen. Some planting/protection in suitable areas is desirable.</p>	Y
Oceanic scrubby oak, or oak-birch woodlands	<i>Graphidion</i> communities present (WSIEC)	At least 50% of young, smooth-barked areas of oak with noticeable evidence of <i>Graphidion</i> lichens present	Visual assessment – look for flecks and mottling on slender, smooth-barked areas of oak twigs and branches, as well as small, coloured mosaics of crustose lichens on smooth bark areas of associated trees & shrubs	<i>Graphidion</i> scarce (found on 1 hazel, other hazels mostly poor with <i>Lecidella elaeochroma</i> the main species). Only common and widespread species seen, no specialist hyperoceanic <i>Graphidion</i> species recorded.	Baseline

Lichen habitat	Attribute	Target	Measure	Results	Target met
Oceanic scrubby oak, or oak-birch woodlands	<i>Lobarion</i> communities present (WSIEC)	At least 10-20% cover of <i>Lobarion</i> lichens on suitable shaded and humid areas of oak, hazel or aspen, and present on some boulders. Aim to maintain the <i>Lobarion</i> component of the WSIEC	Visual assessment – look for <i>Lobarion</i> on areas of trees kept humid by bracken, wood rush, etc. May also be present on boulders.	<p><i>Lobarion</i> recorded on willow, rowan and hazel. The <i>Lobarion</i> is best developed on older willows that appear to predate the recent regeneration but it is readily colonising young willow stems and has just started to colonise young mature rowan and hazel. The <i>Lobarion</i> includes:</p> <p><u>Willow:</u> <i>Pseudocyphellaria crocata</i> (on 6 willow stems c. NC16975 40950), <i>Sticta limbata</i>, <i>Pannaria rubiginosa</i> (F, even on young willow), <i>Lobaria scrobiculata</i> (LF), <i>Nephroma laevigatum</i> (LF), <i>Degelia plumbea</i> s. str. (LF), <i>Sticta fuliginosa</i> (R), <i>S. sylvatica</i> (O), <i>S. limbata</i> (LF).</p> <p><u>Hazel:</u> <i>Lobarion</i> scarce on hazel, appears to just be colonising. Recorded on a couple of hazels including a single-stem hazel (not an old veteran, but developing as a mature 'tree form' hazel) at NC 16966 40948 with basal stems heavily browsed and suppressed. Hazel supports scraps of <i>Pannaria rubiginosa</i>, <i>Sticta fuliginosa</i>, <i>S. limbata</i>,</p> <p><u>Rowan:</u> <i>Lobarion</i> poorly developed and scrappy on most rowans (it appears to be just colonising) but better developed on several trees. Includes <i>Degelia cyanoloma</i>, <i>Pannaria rubiginosa</i>, <i>D. atlantica</i>, <i>Sticta sylvatica</i>, <i>S. limbata</i>, <i>Nephroma laevigatum</i>.</p>	Baseline
Oceanic scrubby oak, or oak-birch woodlands	<i>Parmelietum laevigatae</i> community present especially in moderately exposed and well-lit situations, on acid-barked	Mature oak and birch with at least 60% lichen cover, and at least some <i>Usnea</i> species present on branches and twigs. Aim to maintain the EUOCIEC value of the site.	Visual assessment.	<p><i>Parmelietum laevigatae</i> generally poor but good patches of <i>Parmeliella parvula</i> on birch at NC 16963 40956 and also <i>Parmotrema crinitum</i>, <i>Megalania pulverea</i>. The terrain was very difficult to explore in the time available (rank vegetation, dense scrub, outcrops obscured by dense tall bracken etc.) and so many birch trees in the area remain unexamined - there may be other birches with the <i>P. laevigatae</i> community. <i>Megalania pulverea</i> also on willow. <i>Ochrolechia androgyna</i> and <i>Trapelia corticola</i> on oak.</p>	Baseline.

Lichen habitat	Attribute	Target	Measure	Results	Target met
	trees such as oak and birch, occasionally also on rocks. (EUOCIEC)				
Oceanic scrubby oak, or oak-birch woodlands	No evidence of acid rain effects	No evidence of acid rain (for this habitat, this target needs to be assessed by a lichen specialist).	Visual assessment – decline of diversity in <i>Parmelietum laevigatae</i> community, with loss of more demanding species. May be an increase in <i>Micarea</i> spp. (small, grey or green congealed crusts)	No evidence	Y
Oceanic scrubby oak, or oak-birch woodlands	No excessive algal deposits on tree trunks, branches or twigs, or over lichens	Where the woodland abuts on to agricultural land, trunks, branches and twigs at the periphery should not be seen to carry 20% cover of green, algal 'gunge' deposits	Visual assessment	N/a	Y
Oceanic scrubby oak, or oak-birch woodlands	No evidence of atmospheric pollution	No atmospheric pollution effects	A marked loss of <i>Lobarion</i> lichens, or evidence of discoloration or necrosis	No evidence	Y



Table 6. Ferreira site A, willow carr c. NC 17056 40919. Site Attribute Table for Indirect Monitoring (IMP) – Oceanic, sheltered Salix carr.

Name of recorder: Andy Acton

date: 26.09.14

weather: dry, windy

Lichen habitat	Attribute	Target	Measure	Results	Target met
Oceanic, sheltered Salix carr	extent	No loss of area of woodland	Visual assessment (mapping/aerial photographs)	Recently expanded with abundant regeneration of willow.	Yes
	Stand structure	Maintain at least a 60–90% canopy cover	Mostly closed canopy, with deeply shaded and dappled light areas	Areas with recent regeneration (including basal vegetative regeneration & regrowth) have high canopy cover >85%	Yes
	Longevity of habitat within the stand	The ecological continuity of the stand is maintained through natural vegetative regeneration, providing continuity of habitat and humidity	Visual assessment; look for collapsed Salix regeneration by sending up vigorous vertical shoots	Collapse and regrowth ongoing	Yes
Oceanic, sheltered Salix carr	Freedom from rhododendron	No rhododendron	Visual assessment	No Rhododendron seen	Yes
	Freedom from exotic regeneration	No exotic regeneration	Visual assessment	None seen	Yes
	Mostly an undisturbed habitat	No evidence of grazing animals within the stand	Visual assessment – cattle or sheep may browse at the edges of Salix carrs, but rarely venture inside, because of the tangled branches, waterlogged conditions and scarcity of 'bite'. Look for evidence of broken branches, stripped twigs, sheep's wool on	No evidence of cattle but evidence of recent deer browsing	Yes

Lichen habitat	Attribute	Target	Measure	Results	Target met
			snags – acceptable at the periphery, but should be no evidence within the stand.		
Oceanic, sheltered <i>Salix</i> carr	Very humid conditions within the stand due to almost constant waterlogged conditions	Water-table levels and hydrology maintained at levels to preserve the habitat	Seasonal fluctuations in water-levels are anticipated, but there should be no evidence of regular prolonged periods of drying out	Ground damp	Yes
	<i>Lobarion</i> communities present (WSIEC)	At least 20-40% cover of <i>Lobarion</i> lichens present, especially <i>Sticta</i> spp. Aim to maintain the <i>Lobarion</i> component of the WSIEC	Visual assessment	<i>Lobarion</i> well developed on old willow. On a zig zag through the narrow strip of carr on north side of watercourse between NC 17056 40919 and NC 17041 40932 the <i>Lobarion</i> included: <i>Pseudocyphellaria crocata</i> (F – healthy population, recorded on at least 21 stems), <i>Lobaria pulmonaria</i> (F-LA), <i>L. scrobiculata</i> (F-LA), <i>Pannaria rubiginosa</i> (F), <i>Degelia atlantica</i> (F), <i>D. plumbea</i> s. str. (F-LA), <i>Degelia cyanoloma</i> (R), <i>Nephroma laevigatum</i> (F-LA), <i>Sticta limbata</i> (F), <i>S. sylvatica</i> (O).  Species elsewhere in the carr but outwith transect included <i>Peltigera praetextata</i> .	Yes
	<i>Parmelietum laevigatae</i> community present. (EUOCIEC)	On <i>Salix</i> , and on associated alder and birch, at least 60% lichen cover, and at least some <i>Usnea</i> species present. Aim to maintain the EUOCIEC value of the site.	Visual assessment	<i>Parmelietum laevigatae</i> not present.  <i>Usneion</i> present including <i>U. fragilescens</i> var. <i>mollis</i> .	
	No evidence of acid rain effects	No loss of <i>Lobarion</i> lichens, or decline of species diversity of <i>Parmelietum</i>	Visual assessment – requires assessment by a lichen specialist	No evidence	Yes

Lichen habitat	Attribute	Target	Measure	Results	Target met
		<i>laevigatae</i> from previous assessment			
Oceanic, sheltered <i>Salix</i> carr	No excessive algal deposits on tree trunks, branches or twigs, or over lichens	Where the woodland abuts on to agricultural land, trunks, branches and twigs at the periphery should not be seen to carry 10% cover of green, algal 'gunge' deposits	Visual assessment	No excessive algal deposits on rocks, or over lichens	Yes
	No evidence of atmospheric pollution	No atmospheric pollution effects	A marked loss of <i>Lobarion</i> lichens, or evidence of discoloration or necrosis	No evidence	Yes

Table 7. Ferreira site C, c.NC 16742 38861. Birchwood with occasional oak c. NC 16742 38861. Site Attribute Table for Indirect Monitoring (IMP) – Oceanic scrubby oak, or oak-birch woodlands.

Most of birch trunks/stems not particularly old with much regeneration along the old road, but includes some old birch, rowan and oak and some of the trees may be older than they at first appear.

Name of recorder: Andy Acton

date: 26.09.14

weather: dry, windy

Lichen habitat	Attribute	Target	Measure	Results	Target met
Oceanic scrubby oak, or oak-birch woodlands	extent	No loss of area of woodland	Visual assessment (mapping/aerial photographs)	Recent habitat expansion	Baseline
Oceanic scrubby oak, or oak-birch woodlands	Stand structure	Maintain at least a 20–70% canopy cover	Mosaics of open and closed canopy	Mostly low scrubby canopy c. 5-7m with canopy cover variable but mostly full canopy >80%. Canopy of denser areas may naturally open as stand matures.	Baseline
Oceanic scrubby oak, or oak-birch woodlands	Range of tree and shrub species present – unlikely to be very varied, with perhaps birch the most frequent (or even dominant) component in the stand, with rowan, etc.	Maintain the range of phorophytes to ensure continuation of habitat and niches for the species-rich lichen flora	Visual assessment; look for (and record) the typical relationship between the dominant oak, with birch and perhaps rowan, aspen, hazel and holly	Birch ( <b>D</b> , young thicket in most of area but includes at least some old/mature), rowan ( <b>F</b> , mostly young regeneration, but including some old/mature), young willow ( <b>F</b> ), oak ( <b>R</b> , <b>1 tree, no young regeneration seen</b> ), young aspen (local, on crags), holly (scarce, local). Includes some 'old' birch, oak, rowan.	Baseline
Oceanic scrubby oak, or oak-birch woodlands	Freedom from rhododendron	No rhododendron	Visual assessment	None seen	Y



Oceanic scrubby oak, or oak-birch woodlands	Freedom from exotic regeneration	No exotic regeneration	Visual assessment	None seen	Y
Oceanic scrubby oak, or oak-birch woodlands	Occasional light grazing	A balance between no grazing and over-grazing. A mosaic of glades and closed tree canopy to be maintained, retaining diversity of light/shade, humid and well-ventilated conditions around trees and rocks. No more than 10% ivy and/or bramble present.	Visual assessment; look for evidence of ivy being browsed, glades kept open; ivy or bramble not choking glades or covering boulders or rock outcrops; look for evidence of regeneration of trees and shrubs, is there evidence of thicket regeneration developing	Enough young birch, rowan and willow have established in the recent past. Some ivy has established up old birch and rowan trunks, on old retaining wall and on boulders and crags but not too abundant. Some bramble on ground, but only dense in less accessible areas (e.g. some steep slopes below retaining wall and amongst some areas of boulder scree). Some browsing on accessible bramble and ivy on ground/over low rocks – currently controlled but it could very quickly become a problem if browsing levels were lower. Don't want bramble or ivy to become widely established so recommend maintain/increase browsing and monitor. Continuity of birch, rowan and willow assured for now. Some protection of a few aspen suckers near the crags and any young oak and holly saplings seedlings/saplings (no oak seedlings/saplings seen but possibly overlooked) or planting of a few oaks would be best way to ensure continuity of these species. Grazing exclusion would threaten lichens on rocks and species rich heath.	Y (not critical at moment but bramble & ivy could quickly become a problem - recommend maintain/increase browsing and monitor).
Oceanic scrubby oak, or oak-birch woodlands	<i>Graphidion</i> communities present (WSIEC)	At least 50% of young, smooth-barked areas of oak with noticeable evidence of <i>Graphidion</i> lichens present	Visual assessment – look for flecks and mottling on slender, smooth-barked areas of oak twigs and branches, as well as small, coloured mosaics of crustose lichens on smooth bark areas of associated trees & shrubs	<i>Graphidion</i> present on rowan but species poor with no specialist hyperoceanic <i>Graphidion</i> species.  Multi stem Oak at NC 16722 38876 with a small patch of <i>Pyrenula occidentalis</i> .	Baseline

<p>Oceanic scrubby oak, or oak-birch woodlands</p>	<p><i>Lobarion</i> communities present (WSIEC)</p>	<p>At least 10-20% cover of <i>Lobarion</i> lichens on suitable shaded and humid areas of oak, hazel or aspen, and present on some boulders. Aim to maintain the <i>Lobarion</i> component of the WSIEC</p>	<p>Visual assessment – look for <i>Lobarion</i> on areas of trees kept humid by bracken, wood rush, etc. May also be present on boulders.</p>	<p><i>Lobarion</i> scarce recorded on 6 rowans and several rocks. Only recorded as well developed on rocks at one location.</p> <p><u>Rowan 1:</u> <i>Pannaria rubiginosa</i>, <i>Parmeliella triptophylla</i>, 'Scytonema' lichen, <i>Megalaria grossa</i> and <i>Normandina pulchella</i> on rowan with abundant <i>Lonicera</i> along small stream at NC 16762 38851. Also, just upslope: <i>Jamesiella scotica</i> and what was tentatively identified as <i>Agonimia opuntiella</i> over bryophytes on rock at NC 16768 38860.</p> <p><u>Rowan 2:</u> <i>Degelia plumbea</i> s. str., <i>Toninia plumbina</i> and <i>Sticta sylvatica</i> on rowan at NC16835 38657. <i>S. sylvatica</i> on mossy rock here too (and could be on others in area).</p> <p><u>Rowan 3:</u> at NC16829 38663 with some tiny scraps of <i>D. plumbea</i> s. str. and <i>S. sylvatica</i>. Tree growing between large boulders with a locally well-developed <i>Lobarion</i> at this grid ref. with <i>Lobaria amplissima</i> (some nice large patches here), <i>Arctomia delicatula</i> (a small patch on same rock as the large patches of <i>L. amplissima</i> near base of the rowan), <i>Lobaria scrobiculata</i> (scrap on 1 rock), <i>S. sylvatica</i> (locally frequent), <i>Sticta limbata</i> (a scrap), <i>Leptogium cyanescens</i> (locally frequent on several rocks), <i>Degelia plumbea</i> s. str. (locally frequent on several rocks), <i>Massalongia carnososa</i>. This area will be good <i>Lobarion</i> source of colonisation for the rowans.</p> <p><u>Rowan 4, 5, 6, 7:</u> 4 mature rowans with relatively recently colonised <i>D. plumbea</i> s. str. at NC 16819 38690 .Also on a rock here.</p> <p>Ivy stems on crag by the maturing aspen at NC 16831 38681 with: <i>Leptogium teretiusculum</i>, <i>Toninia aromatica</i>, what was tentatively identified as <i>Vahliella atlantica</i> in crevices at base of aspen.</p>	<p>Baseline</p>
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				Multi stem Oak at NC 16722 38876 with <i>Pannaria rubiginosa</i> , <i>Lobaria pulmonaria</i> , <i>Pyrenula occidentalis</i> , <i>Degelia plumbea</i> s. str. with <i>Toninia</i> , <i>Normandina pulchella</i> , <i>Degelia atlantica</i> , <i>Sticta limb</i> , <i>Biatora epixanthoides</i> . A scrap of <i>L. pulmonaria</i> on rock near base of tree.	
Oceanic scrubby oak, or oak-birch woodlands	<i>Parmelietum laevigatae</i> community especially in moderately exposed and well-lit situations, on acid-barked trees such as oak and birch, occasionally also on rocks. (EUOCIEC)	Mature oak and birch with at least 60% lichen cover, and at least some <i>Usnea</i> species present on branches and twigs. Aim to maintain the EUOCIEC value of the site.	Visual assessment.	<i>Parmelietum laevigatae</i> not seen on birch	Baseline.
Oceanic scrubby oak, or oak-birch woodlands	No evidence of acid rain effects	No evidence of acid rain (for this habitat, this target needs to be assessed by a lichen specialist).	Visual assessment – decline of diversity in <i>Parmelietum laevigatae</i> community, with loss of more demanding species. May be an increase in <i>Micarea</i> spp. (small, grey or green congealed crusts)	No evidence	Y
Oceanic scrubby oak, or oak-birch woodlands	No excessive algal deposits on tree trunks, branches or twigs, or over lichens	Where the woodland abuts on to agricultural land, trunks, branches and twigs at the periphery should not be seen to carry 20% cover of green, algal 'gunge' deposits	Visual assessment	N/A	Y

Oceanic scrubby oak, or oak-birch woodlands	No evidence of atmospheric pollution	No atmospheric pollution effects	A marked loss of <i>Lobarion</i> lichens, or evidence of discoloration or necrosis	No evidence	Y
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## ANNEX 4: ADDITIONAL NOTES ON THE REGENERATION/PLANTING AREAS

### Maturing regeneration areas along sea shore of Loch an Obain

Stand of trees formerly (prior to regeneration) probably just a few old trees on crags, now a small stand of birchwood with birch (D), rowan (O), willow (local, young regeneration), holly (regeneration <1m tall) and hazel (R).

#### Lichens:

The maturing regeneration supports little lichen interest as yet but the woodland species recorded in the stand include:

#### c. NC 16893 40071:

- 1) *Thelotrema lepadinum* on an old birch pre-dating recent flush of regeneration
- 2) *Degelia cyanoloma* on a rowan (possibly of phoenix origin)
- 3) *Parmeliella parvula* and *Dimerella lutea* on bryophytes on an outcrop

#### NC 16872 40055:

*Sphaerophorus globosus* on rock (a common species on rock but also a component of the *Parmelietum laevigatae* lichen community on birch).

#### At NC 16893 40028:

- 1) Three old birches, one with *Lobaria pulmonaria* (on lignum), and one with a well-developed lichen flora and *Usneion*. All lichen species on the birch with the well-developed flora are common but includes abundant *Ochrolechia androgyna* (a *Parmelietum laevigatae* species also present on the other two old birch examined here and a good source for colonisation of the younger regenerating birches).
- 2) Two hazels with a well-developed (though species poor) *Graphidion* including *Pyrenula occidentalis* (F), and some *P. macrospora*. On both hazels the main old stem has died but the hazel is secure for now (one has two established stems and the other has one established stem). Further basal shoots on the hazel are suppressed by browsing and it is likely these hazels will need some successful basal shoots at some point.

The stand should mature into a good patch of natural woodland that should in theory be capable of supporting a well-developed lichen flora. The main issue is probably the absence of any hazel regeneration (by seed or vegetatively).

### Maturing regeneration/planting to south of Loch a' Chreagain Daraich

Patches of birchwood with tree regeneration/planting. Trees include birch (A-D, mostly maturing birch and young regeneration but some old birch associated with crags), willow (F-LA, mostly scrubby), rowan (F, mostly established and young regeneration, some mature rowan associated with crags), oak (R, mature scrubby oak confined to crags, no regeneration noted), aspen (R, young mature tree on crag, no regeneration noted when viewed from just below aspen crag).

#### Lichens

Mature rowan with *Pyrenula occidentalis* (e.g. at NC 16908 39262, NC 17030 39253).

Old rowan in block scree at NC 17029 39274 with abundant *L. pulmonaria* and *D. atlantica*, and also some *D. plumbea* s. str. Also *L. pulmonaria* and *D. atlantica* on heather stems and *Hymenophyllum wilsonii* on scree. Further upslope a mature rowan amongst block scree at NC 17004 39270 with *Lobaria pulmonaria*, *Degelia atlantica* and *D. cyanoloma*. On the scree here: *D. atlantica*, *Leptogium cyanescens* and *Ochrolechia tartarea* and *Hymenophyllum wilsonii* on sloping slab at base of crag.

Just upslope of scree at NC 17016 39259: a particularly good (and fertile) population of *L. pulmonaria* on crags (on bare rock and growing on steep slabs in a distinctive *Luzula sylvatica*-*L. pulmonaria*-*Polypodium vulgare* community), on a dead fallen rotting tree, on four mature rowans (and associated *Lonicera*) and on a mature aspen.

Veteran phoenix rowan at NC17044 39253 with *L. pulmonaria*, *P. occidentalis*, *D. cyanoloma*.

Dead fallen birch with *O. androgyna*.

Some *S. globosus* on boulders. *Protopannaria pezizoides* in crevices in crag.

There is no young establishing oak. It would be desirable to plant/protect some young oak and protect any aspen suckers if necessary. No hazel was seen here.

### **Maturing planted trees/regeneration to the NW of Loch Duartbeg**

Young established birchwood with birch (D), rowan (O) and willow (O-LF). The young maturing trees support common pioneer lichen species.

#### Lichens:

No old woodland *Lobarion* species recorded as epiphytes but *Lobarion* on a rock outcrop at NC 16493 38916 includes *Pannaria rubiginosa*, *Leptogium lichenoides* and *Degelia atlantica*. These lichens should colonise the rowans as the trees mature. Two of the more mature rowans (at NC 16510 38893) have 'mossy crotches' that support *Normandina pulchella* and *Normandina acroglypta* and this niche is perfect for colonisation by *Lobarion* species. One of the more mature birches has a good patch of fertile *Megalania pulvereana*. The outcrops and rocks here support small amounts of *Ochrolechia androgyna* and *Sphaerophorus globosus* which should hopefully colonise the maturing birch in this stand. Also *Agonimia tristicula* growing on the *Degelia atlantica*.

The stand should mature into a good patch of natural woodland that should in theory be capable of supporting a well-developed lichen flora. No hazel or oak was recorded so these could be planted/protected in suitable areas if desired.

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