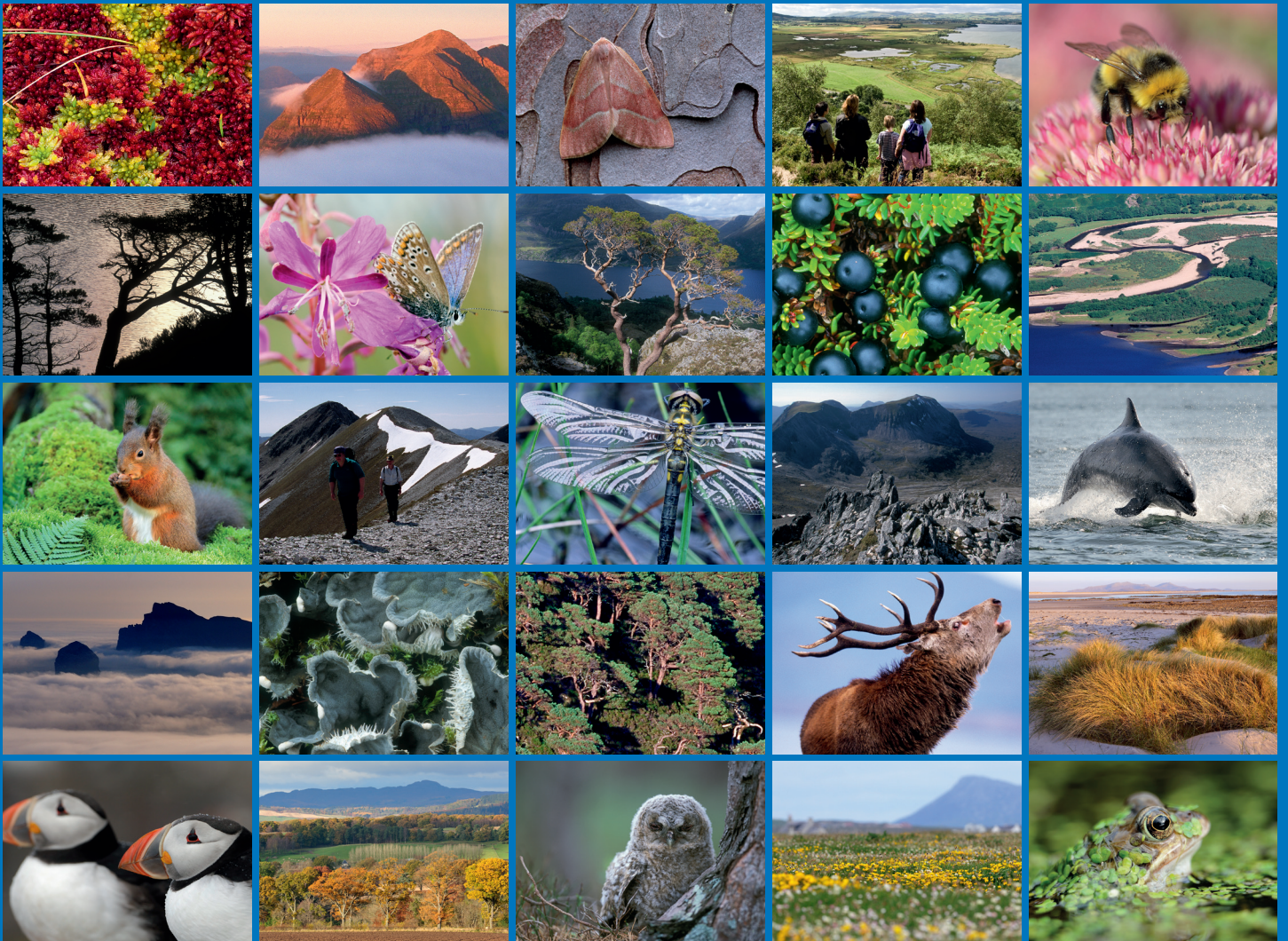


# Loch a' Mhuilinn SSSI – Site Condition Monitoring of lichen feature 2014





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# RESEARCH REPORT

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**Research Report No. 1089**

## **Loch a' Mhuilinn SSSI – Site Condition Monitoring of lichen feature 2014**

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## **SCM Reports**

This report was commissioned by SNH as part of the Site Condition Monitoring (SCM) programme to assess the condition of special features (habitats, species populations or earth science interests) on protected areas in Scotland (Sites of Special Scientific Interest, Special Areas of Conservation, Special Protection Areas and Ramsar). Site Condition Monitoring is SNH's rolling programme to monitor the condition of special features on protected areas, their management and wider environmental factors which contribute to their condition.

The views expressed in the report are those of the contractor concerned and have been used by SNH staff to inform the condition assessment for the individual special features. Where the report recommends a particular condition for an individual feature, this is taken into account in the assessment process, but may not be the final condition assessment of the feature. Wider factors, which would not necessarily be known to the contractor at the time of the monitoring, are taken into consideration by SNH staff in making final condition assessments.



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## RESEARCH REPORT

# Summary

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### Loch a' Mhuilinn SSSI – Site Condition Monitoring of lichen feature 2014

**Research Report No. 1089**  
**Project No: 113952**  
**Contractor: Anna Griffith**  
**Year of publication: 2020**

#### Keywords

Loch a' Mhuilinn; Site Condition Monitoring; lichen; Lobarion; *Graphidion*; *Parmelion*.

#### Background

Loch a' Mhuilinn Site of Special Scientific Interest (SSSI) lies on the northwest 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.

The British Lichen Society (BLS) reviewed the lichen interest of woodlands and parklands in Britain and assessed Loch a' Mhuilinn as Grade 2 National Importance (Fletcher *et al.*, 1982). The first lichen Site Condition Monitoring (SCM) visit was carried out in May 2004 when the baseline was set up. A second SCM visit took place in October 2010. This report represents the third SCM visit to assess the condition of the lichen assemblage.

#### Main findings

The main botanical interest found in this survey can be summarized as follows:

- The lichen assemblage was assessed as being maintained in favourable condition in 2014.
- The direct monitoring plots from 2010 were revisited and no significant change was recorded for all species/communities. The direct monitoring was expanded to include additional monitoring locations.
- Indirect monitoring revealed that targets were met for all habitat attributes.

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## 1. INTRODUCTION

### 1.1 Background

Loch a' Mhuilinn SSSI lies on the northwest coast of Sutherland near sea level, on a bedrock of Lewisian Gneiss. The mixed deciduous woodland extends over gently undulating slopes and low ridges so that most aspects are represented and in places, trees and scrub give way to open coastal heaths and grasslands. The woodland also displays the relative effects of exposure particularly well, and contains unusual forms of oak. There is an exceptional woodland lichen flora.

The basis for citing lichens as a feature of the SSSI appears to come from a brief report made by James & Rose (1974) (see Site Dossier for Loch a' Mhuilinn). The James & Rose report states that the woodland was of high interest and importance in a Sutherland context, and the evidence gathered from their one day visit was used in the site being designated at Grade 2 (National Importance) in Fletcher *et al.* (1982).

The first lichen Site Condition Monitoring (SCM) visit was carried out in 2004 when the baseline SCM was set up. The SCM was repeated in 2010 and the subsequent report (Coppins & Coppins, 2010) recommended the following condition for the component lichen habitats:

**Oceanic upland old-growth woodland (wood pasture)** – favourable maintained

**Oceanic, sheltered *Salix carr*** – favourable maintained

This report represents the third SCM visit to assess the condition of the lichen assemblage.

### 1.2 Previous lichen survey data

Loch a' Mhuilinn SSSI has received relatively few visits by lichenologists as summarised in Table 1. Further details of these visits are given in the site dossier (Coppins, 2005), the baseline SCM (Hope *et al.*, 2004) and first repeat SCM (Coppins & Coppins, 2010).

Table 1. Previous visits by lichenologists.

Author	Surveyor(s)	Year	Brief details
James, P.W & Rose, F.	James, P.W & Rose, F.	1974	James & Rose (1974) <i>Report on Survey of Lichen Habitats in NW Sutherland, September 21 – October 1, 1974</i> . Unpublished report for NCC.
Coppins, A.M. & Coppins, B.J.	Coppins, A.M. & Coppins, B.J.	2002	Species list only prepared
Hope, J.C.E., Coppins, A.M. & Coppins, B.J.	Hope, J.C.E., Coppins, A.M. & Coppins, B.J.	2004	<i>Baseline SCM for lichens in Scotland: Loch a' Mhuilinn SSSI</i> . Unpublished report for SNH.
Coppins, A.M. & Coppins, B.J.	Coppins, A.M. & Coppins, B.J.	2010	<i>Loch a' Mhuilinn NNR/SSSI first repeat SCM (lichens)</i> . Unpublished report for SNH.

### 1.3 Objectives

The aim of the survey is to repeat the Site Condition Monitoring (SCM) for the lichen assemblage carried out in 2004 and 2010.

## **2. METHODOLOGY**

### **2.1 Field survey team, timing and duration**

The Site Condition Monitoring (SCM) for the lichen assemblage at Loch a' Mhuilinn SSSI was carried out by A. Griffith on 24 and 27 September 2014. Repeat photographs were taken where there had been noticeable change since previous monitoring or where new sample plots were established; otherwise the photographs in this report are those taken during 2004 and 2010 monitoring.

### **2.2 Indirect monitoring**

The lichen habitats were assessed through Indirect Monitoring using the following Site Attribute Tables (SATs) for lichen habitats: 'Oceanic upland old-growth woodlands (wood pasture), and 'Oceanic sheltered *Salix carr*' (Annex 3).

Sample locations were widely distributed throughout the site to give a representative assessment of the oceanic wooded ravine lichen habitat condition. The grid reference of each sample location was recorded using a Garmin eTrex H GPS and the appropriate targets were assessed. Once all locations had been visited, the site-scale SAT was completed. The surveyor used their judgement as to whether, on the basis of the number of sample locations visited, each target was met, and this was supported with notes. This approach provides a rapid assessment of the lichen habitat and avoids undue influence on the results due to unrepresentative sample plots.

The 2010 surveyors concentrated on four monitoring plots (Coppins & Coppins, 2010):

(i) the Indirect Monitoring Plot (IMP) 1a, is situated inside an enclosure plot, set up to discover what the effects of excluding all herbivore impact would be on the woodland habitat, especially, regeneration of hazel. In view of the high importance of hazel at Loch a' Mhuilinn for supporting lichen assemblages, we felt that regularly monitoring what was happening within the enclosure plot would inform general management for the whole SSSI.

(ii) IMP 1b plot is situated immediately adjacent to the enclosure plot, as this was believed to be pertinent to monitor what was happening just outside the enclosure plot, and to be able to compare with what was happening within.

(iii) IMP 2 and IMP 3 were set up to record 'Oceanic upland old-growth woodlands – wood pasture' at two plots within the overall site, mostly focussing on veteran hazels in a remnant pasture woodland habitat.

(iv) IMP 4 focuses on a distinctive area of Oceanic sheltered *Salix carr*, which is of localized occurrence, but is an important component habitat for supporting the lichen interest of this site.

In 2014 these locations were visited along with a number of others. The information gained at the 2010 and 2014 locations are summarised in one SAT for each relevant habitat. Repeated photos together with the originals are provided after the relevant SAT.

### **2.3 Direct monitoring**

Direct monitoring was used to monitor lichen communities/species of particular importance. For baseline SCM suitable target communities and/or species were selected from the relevant site dossier. In the field these target communities/species were searched for and for one or more locations where found Direct Monitoring Plots (DMPs) were set up. In some cases existing information (survey reports, grid references from Scottish Sites Lichen Database/National Biodiversity Network Gateway data) was available to help identify locations suitable for DMPs. For each DMP a Direct Monitoring Form (DMF) was completed giving sufficient information to relocate and assess for any changes. Photographs were



taken where appropriate. For repeat SCM the baseline Direct Monitoring Plots (DMPs) from the first cycle of SCM were revisited and monitored. In addition, where time allowed, additional DMPs were established and/or existing DMPs were expanded upon. This was done on the basis of findings in the field, or from recommendations in an existing dossier, or from recommendations in site dossiers updated since the first cycle of SCM.

## **2.4 Additional observations/recording**

Direct monitoring alone is not always sufficient to assess the state of the lichen communities/species. Negative changes at individual DMPs could reflect decline throughout the site or just represent localised effects. Thus, in addition to the direct monitoring, casual observations were made of the overall health/viability of lichen communities/species throughout the relevant habitat to put the direct monitoring into context and thus assist in overall condition assessment (section 2.5).

## **2.5 Condition assessment**

For the lichen assemblage on the site to be assessed to be in favourable condition all of the attributes of all habitat types monitored must meet their targets. Thus if any indirect attribute failed to meet the target then the lichen assemblage on the site is in unfavourable condition (SNH, 2012). However, assessment of decline in health/viability of communities/species may be more problematical (section 2.4). Thus overall condition assessment takes into account the results of indirect monitoring, direct monitoring plus any additional observations made on the health/viability of lichen communities/species during the course of the field survey.

## **2.6 Site management**

A range of pressures may affect the condition of the lichen assemblage. The SNH standard list of pressures is provided in Table 6 (Annex 1) from which those appearing to be currently affecting the condition of the lichen assemblage were selected.

## **2.7 Survey constraints**

Two days were allowed for the repeat SCM. The site comprises areas of steeper terrain and tall vegetation that reduces the speed with which SCM can be carried out. However, whilst additional indirect monitoring locations were recorded and direct monitoring was expanded, access was limited to previously visited parts of the site. In the absence of a more detailed baseline lichen survey on which to base SCM and with just two days this was not felt to have had any significant impact on the SCM assessment.

## **2.8 Nomenclature**

Nomenclature follows Coppins (2002) for lichens, Hill *et al.* (2008) for bryophytes, Stace (1997) for vascular plants and James *et al.* (1977) for lichen communities.

### 3. RESULTS

The locations of the Indirect and Direct Monitoring plots are provided in Figures 1 and 2. Photographs of the site are provided in Figures 3 to 10.

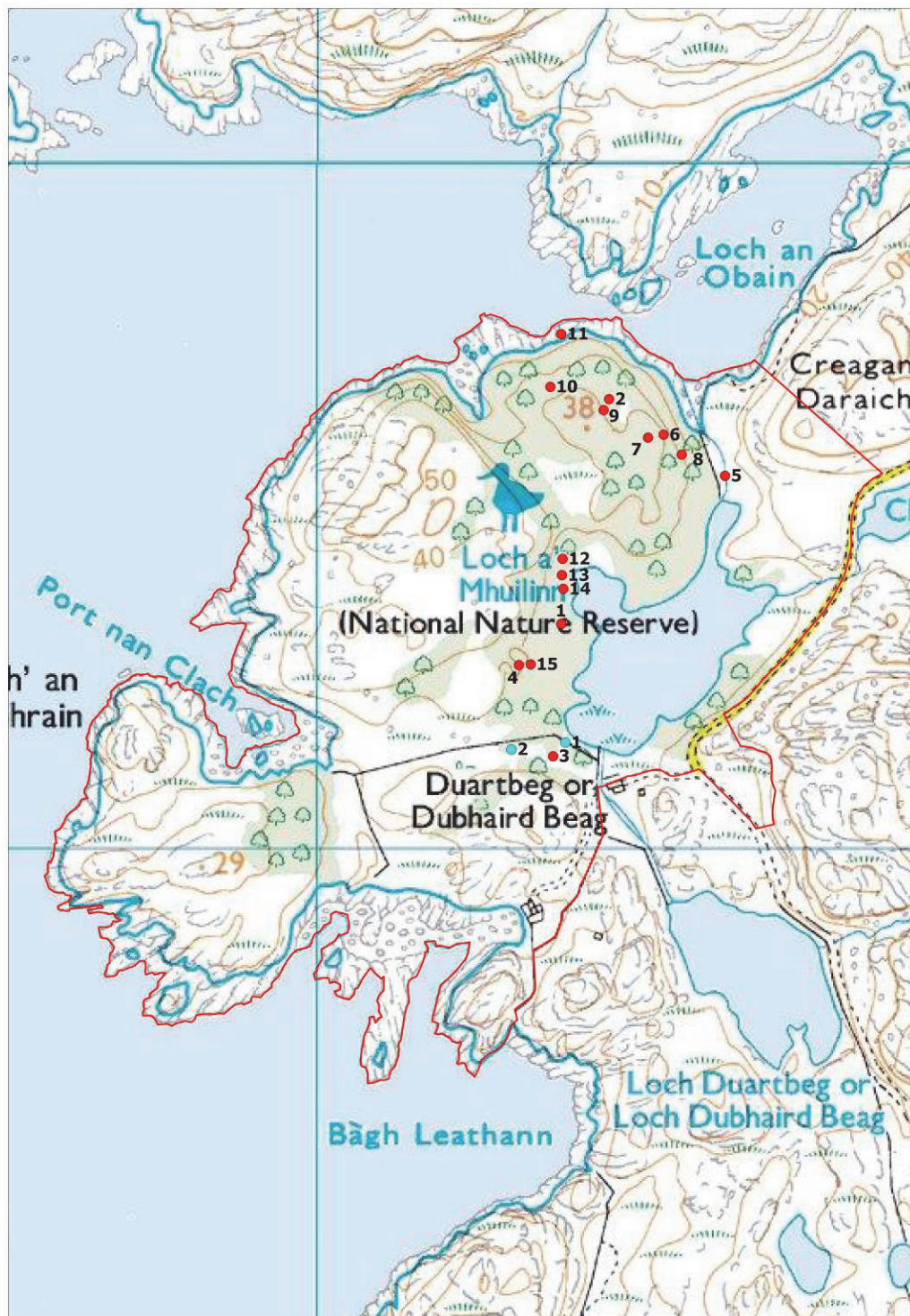


Figure 1. Site map showing approximate locations of the Indirect Monitoring Plots for oceanic old growth wood pasture (red dots) and oceanic sheltered Salix carr (light blue dots). Map based upon Ordnance Survey material with the permission of the Controller of HMSO © Crown copyright. Licence no. 100017908.



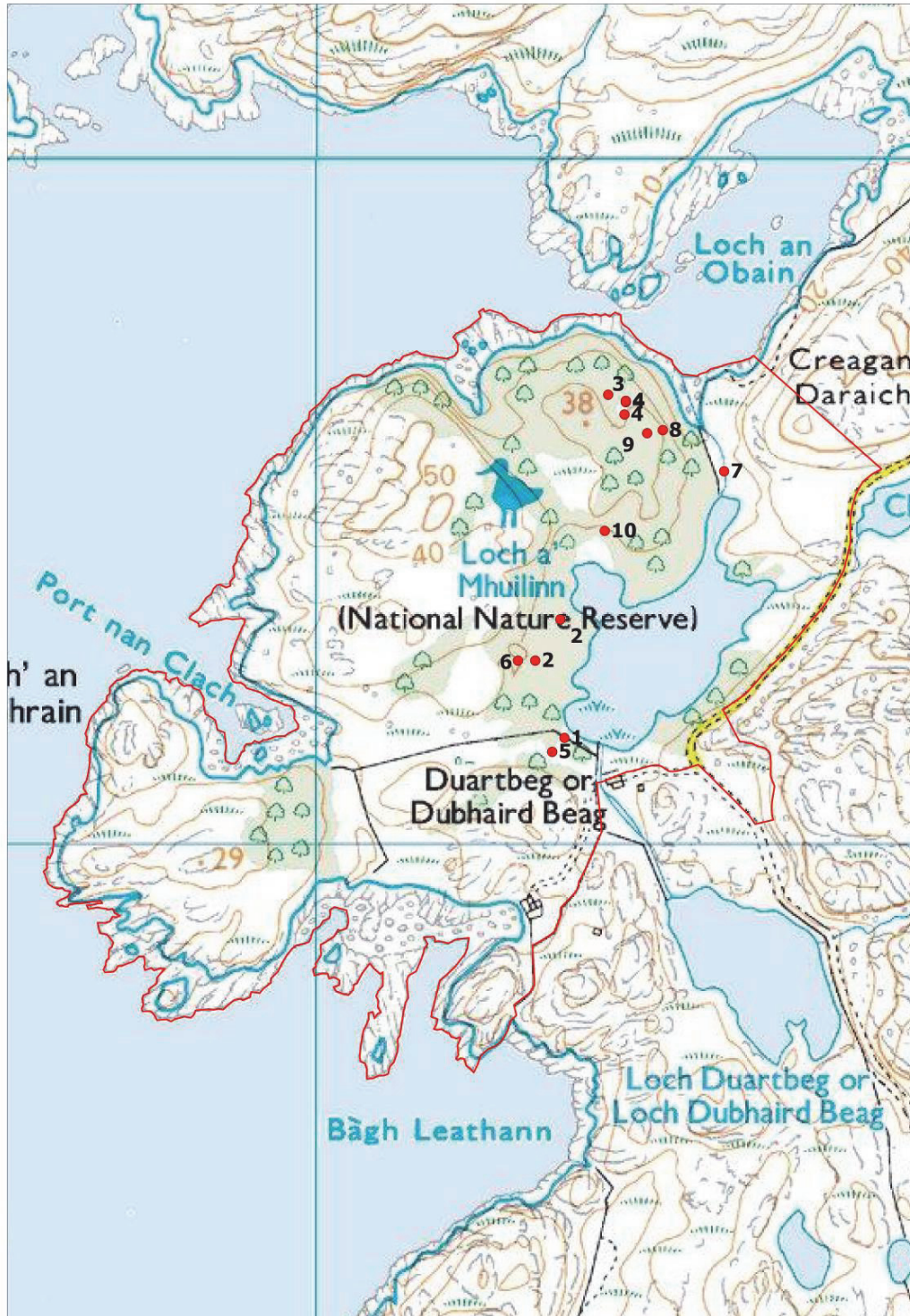


Figure 2. Site map showing approximate locations of Direct Monitoring Plots (duplicate numbers exist for DMPs with scattered sample locations). Based on Ordnance Survey material with the permission of the Controller of HMSO © Crown copyright. Licence no. 100017908.

### 3.1 Indirect monitoring

The results of the indirect monitoring are summarised in Table 2. Table 2 lists the lichen habitats monitored, which habitat attributes failed to reach their targets, any obvious reasons for failure, and includes details on the rationale for any surveyor judgements made about whether particular targets are met. The completed Attribute and Target Tables are given in Annex 3.

Table 2. Lichen habitats monitored and habitat attributes that failed to meet their targets at during Indirect Monitoring

Lichen Habitat	Attributes that failed to meet targets	Reason for failure/other comment
Oceanic upland old-growth woodlands (wood pasture)	None	N/A
Oceanic sheltered <i>Salix carr</i>	None	N/A

With respect to the oceanic upland old-growth woodland it appears that little has changed outside the enclosure since SCM baseline established in 2004. However, it is difficult to make a comparison as 4 IMPs were assessed in 2004/2010, compared to 13 in 2014. Regeneration establishment noted that probably reflects management changes in the last c. 40 years. Currently successfully established birch, hazel and willow regeneration (vegetative for hazel and willow) appears sufficient, with limited potential for further regeneration via seed due to canopy cover, and possibly due to tall, dense field layer in glades. However, current browsing levels may not be low enough to allow occasional hazel 'sun shoots' to establish in the canopy. Certainly, virtually no basal shoots were unbrowsed in 2014, the tallest being temporarily protected by bracken. No evidence of recent recruitment (last few years) was observed, but may be present; only a small number of hazel stools could be investigated in the time available. It is difficult to assess this without more detailed monitoring of the hazel stools. Successful aspen regeneration was not observed in the areas visited, although many suppressed seedlings/saplings (suckers) were noted. It is important that deer management is continued in a way that is compatible with ensuring periodic small regeneration events (e.g. recruitment of a few 'sun shoots' to the canopy of a hazel stool) scattered across the site, rather than that which would encourage a pulse of widespread regeneration that could lead to infilling of glades and shading of existing lichen habitat.

Only a small stand of oceanic sheltered *Salix carr* was encountered during SCM. It would be useful to identify other stands to enhance indirect monitoring outputs.

### 3.2 Direct monitoring

The results of the direct monitoring are summarised in Table 3. Table 3 lists all lichen communities/species monitored, health/viability/abundance, any observed change in health/viability/abundance, and any additional notes (e.g. to help interpret any changes). The completed direct monitoring forms and supporting photographs are given in Annex 4.

### 3.3 Additional observations/recording

Details of additional observations (as described in section 2.4) are included in Table 3 and individual Target Notes are given in Table 7, Annex 2.

Table 3. Summary of 2014 direct monitoring results and notes on any additional observations of lichen communities/species. Direct Monitoring Form (DMF) numbers are the same as in Hope et al. (2004) and Coppins & Coppins (2010)

DMF number	Target lichen community/species	Health/viability abundance in the direct monitoring plot	Notes & additional observations – assess if any change is likely to be significant or insignificant in the context of the site
1, 2, 6	<i>Pseudocyphellaria norvegica</i>	Some losses and gains, but overall it appears a dynamic situation, with apparent gains as well as losses. Population of this species appears healthy and viable at the site scale.	DMP 1: no <i>P. norvegica</i> seen on target tree or nearby. Very tiny lobes could have been overlooked. As in 2010 the reasons for decline is unclear, but may be related to changes in the bryophyte assemblages. Losses and gains due to natural dynamics seen in DMPs 2 and 6. <i>P. norvegica</i> found elsewhere on site (see target notes). DMP 2 expanded to include additional trees – new baseline established.
4	<i>Pseudocyphellaria crocata</i>	No significant change. One additional location recorded. Healthy, viable.	Only found at this location, may be elsewhere on site. Vulnerable – infilling of this area with regeneration or fire (tall, old heather) poses a threat to population.
5	<i>Lobaria amplissima</i>	Fairly healthy, also on adjacent tree. Viability questionable as only on 2 trees, maybe elsewhere on site.	This species of the <i>Lobarion</i> community is of rather localized occurrence at Loch a' Mhuilinn. Would be useful to search for additional locations.
2, 8, 10	<i>Lobarion</i> community	Healthy and viable.	Baseline established 2014; potential to expand to include additional locations.
3, 7, 9	Typical birch community	Healthy and viable.	Difficult to draw any comparison with 2004 and 2010 as different trees examined in all three years. DMP 3 altered to provide a simple repeatable plot including more trees and covering conspicuous lichen species typical of birch at this site. DMPs 7 and 9 are baselines in 2014. This community is widespread throughout the site on older birch, and may develop on younger birch over time.
8	<i>Graphidion</i> community	Healthy and viable.	Baseline established 2014, but needs developing further. Not particularly diverse, limited time to search, so limited to recording conspicuous species. Needs expanding to include more 'interesting' species and more locations in order to fully assess and monitor condition.

### 3.4 Condition assessment

Table 4 summarizes the condition assessment of the lichen assemblage in 2004, 2010 and 2014. The table lists all the lichen habitats, lichen communities and species used as a basis for the assessment and whether the targets have been met for these habitat attributes and health/viability of target communities/species.

Based on this information, and following the approach set out in section 2.5 it is recommended that the condition of the lichen assemblage is assessed by SNH as 'favourable, maintained' condition.

*Table 4. Condition assessment of the lichen assemblage at Loch a' Mhullinn SSSI based on the results of indirect monitoring, direct monitoring and any additional observations of lichen communities/species. See Tables 2 and 3 for supporting information.*

Lichen Habitat types or Lichen communities/species	Targets met for all indirect and community/species attributes (Y/N)		
	2004	2010	2014
Oceanic upland old-growth woodland (wood pasture)	Yes	Yes	Yes
Oceanic sheltered <i>Salix</i> carr	Yes	Yes	Yes
<i>Pseudocyphellaria crocata</i>	Baseline	Yes	Yes
<i>Pseudocyphellaria norvegica</i>	Baseline	Yes	Yes, baseline expanded
<i>Lobaria amplissima</i>	Baseline	Yes	Yes
Typical birch lichen community	Baseline	Yes	Yes, baseline amended
<i>Lobarion</i> community	-	-	Baseline
<i>Graphidion</i> community	-	-	Baseline
Overall recommended site condition assessment	<b>Favourable</b>	<b>Favourable - maintained</b>	<b>Favourable - maintained</b>





*Figure 3. 2010 Fig. 1 (NC 165.396) area near Indirect Monitoring plot 2, part of the sheltered, low-lying area of the wood. This is a typical example of the ancient, strangely-formed old hazels that persist on sheltered slopes and broad terraces within Loch a' Mhuilinn SSSI. The abundant cover of bryophytes and lichens gives an almost tropical feel to these areas, despite the northerly position of the site.*





*Figure 4. 2010 Fig. 2 (NC 1636 3915), willow carr at southern edge of the loch of Loch a' Mhuilinn.*



*Figure 5. 2010 Fig. 3 Low-lying boggy area between wooded knolls. There is a range of diversity related to exposure, shelter and topography, with birch, oak, rowan, aspen, willow and hazel. The oaks represent the most northern remnant of native.*





*Figure 6. 2010 Fig. 4 View across the site, including an oak on a rocky knoll, the tree shaped by the strong prevailing winds.*



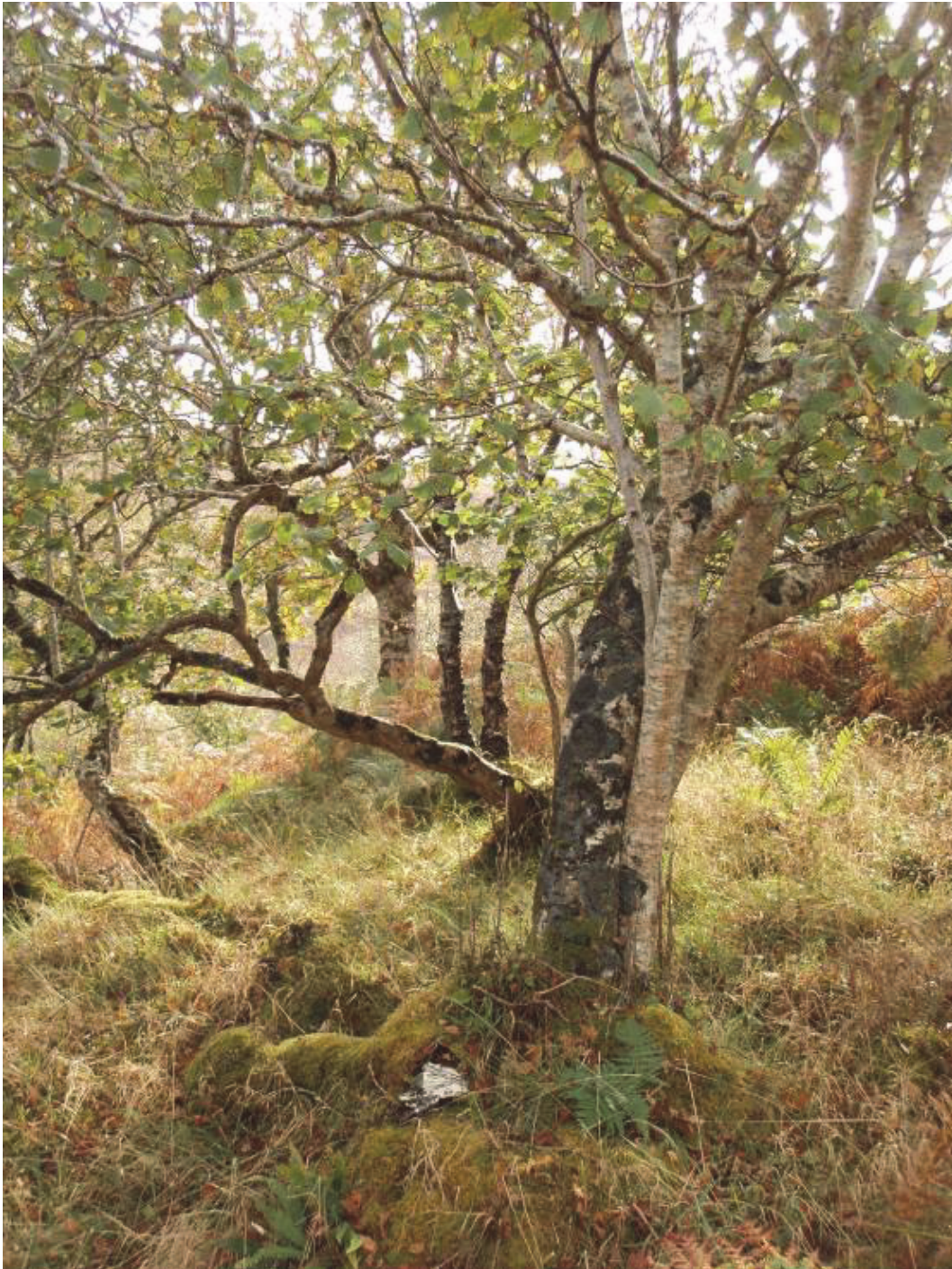
*Figure 7. 2010 Fig. 5 Contorted birch at the northern part of the site, in a mostly birch-dominated area*





*Figure 8. 2010 Fig. 6 Loch a' Mhuilinn, October 2010: this hazel occurs on a gentle slope between 2010 IMP1b, and 2010 IMP2. It is quite an open, gladed situation, and deer wandering upslope obviously stop and browse at the basal regeneration on this old stool. Severe reduction in deer numbers for 5–10 years would enable basal regeneration to get established above browsing height. Deer numbers should then be allowed to gradually increase, to avoid glades closing in due to abundant seed regeneration. It is notoriously difficult to be prescriptive about achieving the right balance in grazing management in woodlands. An attempt was made to locate this hazel in 2014 to compare browsing damage/regeneration success. Unfortunately it was not located in the time available.*





*Figure 9. 2010 Fig. 7 Loch a' Mhuilinn, October 2010: this hazel is adjacent to the one shown in 2010 Fig. 6 above. Again, constantly thwarted and browsed basal regeneration can be seen from the little cluster of dead sticks at the base. But here, beside the main "trunk" are two well-established young hazel stems which have clearly got away successfully from the base at some time in the past. The older "trunk" is grey with lichens of the Lobarion community, and the two younger, smooth-barked stems, are mottled with mosaics of lichens of the Graphidion community. As with Fig. 8 it would have been interesting to relocate and compare. Unfortunately this hazel was not relocated in the time available.*





*Figure 10. Many of the hazel stools have relatively young stems that appear to have successfully established in the last c. 20 years or more. Although this hazel has more numerous younger stems than most, examination of many of the photos throughout this report will show many hazels across the survey area have similar young stems indicating habitat continuity in the medium term. Basal shoots are currently suppressed by browsing and careful monitoring is required to confirm whether or not recruitment continues to occur, and deer management altered accordingly.*





*Figure 11. Tree tubes protecting aspen and oak are a useful tool for facilitating the establishment of localised regeneration of species which are struggling to regenerate, or where widespread regeneration events would be undesirable (infilling of glades) or unachievable (regeneration of other species widespread leaving little potential for other species).*

#### 4. MANAGEMENT NOTES

The lichen assemblage has been assessed as in favourable maintained condition. All targets were met, however, only continued monitoring of regeneration of hazels (particularly the success of basal regeneration) and other species will determine that regeneration is successful and occurring at sufficient frequency and levels to maintain habitat continuity and that herbivore impacts are indeed at appropriate levels in the long term. See Table 5 and sections 5.2 for further discussion.

Table 5 lists the standard pressures (as selected from Table 6, Annex 1) that appeared to be affecting the condition of the lichen assemblage in 2014.

*Table 5. Pressures that appeared to be affecting the condition of the lichen assemblage at Loch a' Mhuilinn SSSI. Pressures are selected from the standard SNH list provided in Table 6, Annex 1.*

<b>Pressures likely to be affecting feature condition</b>	<b>Notes (brief details of positive/negative impacts, and if pressures have changed since the previous assessment)</b>
Grazing – over	<p>Although there has been relatively recent successful regeneration of birch and vegetative regeneration of hazel (probably as a result of management changes in the last c. 40 years – sheep removal, deer fencing, deer cull), browsing levels may currently be too high for continued occasional recruitment of ‘sun shoots’ into the hazel canopy. Certainly, virtually no basal shoots were observed as being unbrowsed, the tallest being temporarily protected by bracken. No evidence of recent recruitment (last few years) was observed. It is difficult to assess the trend in browsing levels without more detailed monitoring of the hazel stools. Aspen suckers are also being suppressed.</p> <p>There is little current potential for further regeneration of e.g. birch in the areas visited due to canopy cover. Regeneration would be possible in glades, but may not occur, regardless of browsing levels, due to a rank field layer. Infilling of glades would be highly undesirable.</p> <p>It is important that deer management is continued in a way that is compatible with ensuring periodic small regeneration events (e.g. recruitment of a few ‘sun shoots’ to the canopy of a hazel stool) scattered across the site, rather than that which would encourage a pulse of widespread regeneration that could lead to infilling of glades and shading of existing lichen habitat.</p>

## 5. RECOMMENDATIONS

### 5.1 Lichen survey/monitoring

In addition to repeating the Direct and Indirect Monitoring detailed in this report, it is strongly recommended that future SCM cycles monitor that the following actions have been taken forward:

- **Recommendation 1.** Include within the DMPs some simple monitoring of hazel stools to identify whether recruitment of ‘sun shoots’ to the canopy is continuing to occur at a level sufficient to ensure continuity of lichen habitat. No recent (last few years) recruitment was observed in 2014, with basal shoots browsed, although older (maybe within last 20 years) shoots were present. Such monitoring can inform management for lichens.
- **Recommendation 2.** The current exclosure plot (used as an Indirect Monitoring Plot), should be maintained indefinitely, as experiments such as this gain in value through time as a means for demonstrating and understanding the role of large herbivores in the ecosystem.
- **Recommendation 3.** Expand SCM to cover more of the site. Additionally DMPs for species and communities require expanding to improve the robustness of monitoring. In particular, monitoring of the *Graphidion* community and *Lobaria amplissima* has been rather limited so far.
- **Other Recommendations:** A detailed lichen survey is required to fully assess the current status of the lichen interest at Loch a’ Mhuilinn SSSI. This was recommended by Hope *et al.* (2004) and Coppins & Coppins (2010):
  - The lichen attributes mentioned in the SSSI citation on which selection for SCM is based, are mostly based on a survey carried out by James & Rose in 1974 (over 30 years ago), plus a casual visit of three days by Coppins (2002), when an extensive species list was generated, but no detailed site localities or detailed survey report was produced.
  - This site is designated as Grade 2 (National Importance) in Fletcher *et al.* (1982), based on the assessment made in James & Rose (1974):  
“Of all the woodlands examined in Sutherland, this is one of the most interesting and important.”
  - Besides having a generally diverse lichen flora, Loch a’ Mhuilinn is of special interest on account of its status as the most northern site in Britain with such well-developed Lobarion and Graphidion communities. Outliers of this nature may be considered of particular interest in relation to recording species distribution changes arising from climate change.

### 5.2 Management recommendations

The favourable assessment reached in 2004, reiterated in 2010 and 2014 reflects the current positive management for lichens being carried out at this site. The current emphasis on keeping the deer population low in order to allow opportunity for a flush of regeneration is welcomed. However, the cautionary example of the exclosure (set up in 2003), where dense seed regeneration has been so successful in the total absence of all grazing that thickets are quickly developing in former open glades leads to the recommendation that browsing reduction should be of a temporary nature in order to benefit the lichen communities.



- **Management recommendation 1:** Maintain glades.  
Lichens like light. Many trees (mostly veteran hazels) that are currently listed as supporting notable lichen assemblages are those occurring in more open or partially gladed woodland.
- *Pseudocyphellaria crocata* on heather stems in the open areas would also be affected by the establishment of dense regeneration, although ground conditions (boggy, tall, rank vegetation) may prevent tree establishment regardless of browsing levels.
- **Management recommendation 2.** Increase tree regeneration.  
Whilst continuity of birch habitat is assured in the medium term, and possibly hazel (although this requires more investigation) further opportunity for new recruitment of oak, and aspen would be beneficial. There is limited current potential for widespread regeneration due to canopy cover, except within glades, where it may not occur due to a rank field layer regardless of browsing levels. However, infilling of glades should be avoided as this would threaten the condition of the lichen feature through shading of lichen habitat. A temporary reduction in deer numbers may allow some aspen suckers to successfully establish without infilling of glades with birch regeneration (assuming field layer too rank for seedlings to establish). This may also permit some hazel basal shoots to successfully establish. Deer numbers should thereafter be allowed to increase in order to maintain the important glades that are vital features of the pasture woodland habitat. That includes veteran hazels supporting the lichen assemblages for which this site is notified. Alternatively, protection using tree tubes (or similar), as seen at several locations on the site, would facilitate successful establishment of existing aspen suckers.

## 6. REFERENCES

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## ANNEX 1: STANDARD PRESSURES

Table 6. SNH standard list of pressures likely to affect the condition of notified features.

Pressure	Pressure
1. Agricultural operations	25. Pollution - sewerage
2. Burning	26. Presence/changing extent invasive species - NATIVE
3. Development with planning permission	27. Presence/changing extent invasive species - NON NATIVE
4. Dumping/spreading/storage of materials	28. Pressure to be identified
5. Extraction - dredging (capital, maintenance)	29. Proactive on-site management
6. Extraction - maerl	30. Recreation/disturbance
7. Extraction - quarrying	31. Statutory undertaker
8. Extraction - sand & gravel	32. Tourism & recreation
9. Extraction - water (freshwater catchment; industrial, e.g. power station)	33. Trampling
10. Fishing - recreational	34. Waste disposal - quarrying (geological material)
11. Flood defence/coastal defence works	35. Water Dependant Pressure- abstraction
12. Forestry operations	36. Water Dependant Pressure- artificial recharge
13. Game or fisheries management	37. Water Dependant Pressure- diffuse source pollution
14. Grazing - appropriate level	38. Water Dependant Pressure- flow regulation
15. Grazing - over	39. Water Dependant Pressure- morphological alteration
16. Grazing - under	40. Water Dependant Pressure- point source pollution
17. Inter-specific competition	41. Plant pests and diseases: <i>Phytophthora ramorum/kernoviae</i> on Blaeberry of heathland and woodland habitats
18. Maintenance activities carried out on site by an organisation	42. Plant pests and diseases: <i>Phytophthora austrocedrae</i> on Juniper (Juniper dieback)
19. Mineral extraction	43. Plant pests and diseases: <i>Dothistroma septosporum</i> on conifers (Dothistroma needle blight, or Red-band needle blight)
20. Natural event	44. Plant pests and diseases: <i>Phytophthora ramorum/kernoviae</i> on Rhododendron, Larch <a href="http://tinyurl.com/d6wbe8a">http://tinyurl.com/d6wbe8a</a> , other hosts
21. No on-site activities related to feature condition noted	45. Plant pests and diseases: Alder dieback (Including <i>Phytophthora alni</i> and other causes)
22. Non intervention	46. Plant pests and diseases: Heather beetle
23. Pollution - air-based sources (inc. greenhouse gases)	47. Plant pests and diseases: Other/unidentified suspected pest/pathogen
24. Pollution - land-based sources	

## ANNEX 2: TARGET NOTES

Table 7 provides target notes for species/communities and other features of interest. It also includes information on locations of non-native, invasive species.

Table 7. Target Notes.

Target Note	Grid reference	Description
1	NC 16360 39325	Oak with <i>P. norvegica</i> (16+ patches). Recommend incorporate into nearest existing DMP.
2	NC 16360 39421	Several hazels around this location with 1+ 'sun shoots' getting away – photo (Figure 10) shows atypical hazel as has lots that have successfully established. Three oaks in tree tubes planted (presumably) in glade. On a very small scale this is a useful means of establishing young trees of species that are not regenerating successfully during a period when there is little potential for regeneration and when widespread infilling of glades would be undesirable.
3	NC 16359 39397	<i>Leptogium lichenoides</i> and the 'Scytonema' lichen on hazel.
4	NC 16361 39377	<i>P. norvegica</i> and <i>P. triptophylla</i> on hazel.
5	NC 16575 39498	Oak in tree tubes.
6	NC 16578 39501	Oak in tree tubes.
7	NC 16534 39573	Hazel with a good cover of <i>Sticta sylvatica</i> . Also <i>Nephroma laevigatum</i> . Might be useful location for DMP if expand monitoring in future.
8	NC 16420 39638	Two hazel saplings <1m under bracken – getting cropped back to surrounding vegetation height each year. c. 5-10m from nearest hazel.
9	NC 16342 39672	Oak with <i>Lecidea sanguineoatra</i> , <i>Thelotrema lepadinum</i> , <i>Pyrenula occidentalis</i> . Nearby, just before more gentle slopes drop more steeply down to sea some aspen regen. (c. 1.5m).
10	NC 16325 39667	Aspen with <i>Pyrenula occidentalis</i> , <i>Normandina pulchella</i> , <i>Degelia cyanoloma</i> , <i>Lobarion pulmonaria</i> .
11	NC 16319 39670	Aspen with <i>Lecidea sanguineoatra</i> .
12	Not recorded, but near TN11	More aspen regen. some > 1.3m, but many below height of surrounding vegetation. In this area some dead aspen/dead branches.
13	NC 16358 39749	Hazels with <i>Parmeliella triptophylla</i> , <i>Pyrenula macrospora</i> , <i>Pannaria rubiginosa</i> , <i>Thelotrema lepadinum</i> , <i>Degelia atlantica</i> , <i>Normandina pulchella</i> , <i>Pyrenula occidentalis</i> , <i>Dimerella</i> , <i>Porina coralloidea</i> . <i>Thelotrema petraetoides</i> , <i>Lecidea sanguineoatra</i> , <i>Pseudocyphellaria norvegica</i> . Records from a group of hazels that would make a good <i>Lobarion/Graphidion/P. norvegica</i> DMP.

### ANNEX 3: INDIRECT MONITORING ATTRIBUTE AND TARGET TABLES

Table 8. Attribute and target table for Oceanic upland old-growth woodland (wood pasture). Data in black refers to the 2010 survey. Data in blue refers to the 2014 survey. Figures 12-32 show locations surveyed for the Indirect Monitoring assessment in Table 8.

<b>Site:</b>	Loch a' Mhuilinn SSSI
<b>Surveyor(s):</b>	A.M. & B. J. Coppins. A. Griffith
<b>Date of visit(s):</b>	2010 24, 27.09.14
<b>Site:</b>	Loch a' Mhuilinn SSSI

<b>Grid references for sample locations:</b>	
Oceanic upland old-growth woodland (wood pasture)	<b>1a:</b> NC 1657 3954 (NE corner of plot) – inside enclosure, <b>1b:</b> NC 1657 3954 (NW corner of plot) – outside and adjacent to enclosure plot, <b>2:</b> NC 1650 3960 – plot c.15m radius, <b>3:</b> NC 1650 3960 – plot c.15m radius. 2014: NC 16358 38326, NC 16428 39654, NC 16346 39133, NC 16296 39266, NC 16598 39542, NC 16508 39602, NC 1648539598, NC 16534 39573, NC 16420 39638, NC 16342 39672, NC 16358 39749, NC 16360 39421, NC 16359 39397, NC 16361 39377, NC 16313 39267
<p><i>In 2004 and 2010 four indirect monitoring plots were assessed: one within the enclosure plot, one just outside enclosure, and two elsewhere in the woodland. In 2014 these locations were assessed along with a number of other plots. Therefore, the content of the 2014 SAT is not directly comparable with 2010 and 2004 data.</i></p>	
<b>Grid references for sample locations:</b>	

Attribute	Target	Measure	Results	Target met
Extent	No loss of overall area of pasture woodland	Visual assessment (mapping/aerial photographs)	As in 2004 and 2010: no losses detectable for repeat plots, elsewhere nothing to suggest significant loss since 2010.	Yes
Stand structure	Maintain a wood pasture habitat with the majority of mature trees exhibiting an open-grown growth form. At least a 20–60% canopy cover of pasture woodland trees, with a mosaic of open and (occasionally) closed canopy	Visual estimate: estimate % canopy cover, confirm presence of a mosaic of (mostly) open and (lesser) closed canopy cover	Canopy cover variable across the portion of the site visited. c. 25 – 70% in unenclosed areas, 50-70% most typical. No change with respect to 2004/2010 plots and nothing to suggest significant change has occurred since 2010. The exception to this is the one IMP within the enclosure where the regeneration is significantly taller and denser than in 2010 (see photos) – the enclosure is now pretty much impenetrable via the stile. Canopy cover for the IMP within the enclosure was estimated as 25-35% in 2004, 65% in 2010 and whilst the enclosure could not be easily accessed canopy cover will be >65% in 2014. However, the small enclosure represents an insignificant proportion of the site so any negative impacts due to shading will be small when considered at the site scale.	Yes
Range of tree and shrub species present – unlikely to be diverse, with usually one or two tree species dominant	Maintain the essential wood pasture structure of the dominant tree(s) remaining present. Ensure continual presence of other tree & shrub species at appropriate low levels to ensure continuation of habitat and niches for the species-rich lichen flora	Visual assessment; estimate % of dominant tree species to subsidiary tree & shrub species. Look for tree and shrub species reported as being present in SSSI citation, or earlier lichen surveys	Birch is the main canopy species present but there are areas where hazel, willow, oak or aspen are locally dominant. Other species present include, rowan and holly. Difficult to provide a meaningful percentage as a summary of all IMPs as proportions variable across the site. Comparison with the dominant tree species shown on the vegetation classification – main canopy species map (see Coppins & Coppins, 2010 for map) may be useful at picking up large scale changes; in 2014 there were no significant differences. See other relevant sections for information on tree regeneration and therefore continuity of habitat.	Yes

Attribute	Target	Measure	Results	Target met
Age range of trees present, with emphasis on old trees, but at least some maturing trees and young trees	Old trees always present; maintain at least 60% old trees; aim for at least 10% maturing trees and 5% young trees at each visit	Visual estimate: estimate % of old trees with maturing trees and young trees, plus any saplings of more than 1.5 m high	Across area visited there were: Some old birch; more (frequently spindly), younger mature birch (maybe c. 40 years old; perhaps dating from the deer fencing in 1978); thicket stage birch (in the enclosure); old/veteran hazel, some with successfully established younger hazel stems (probably within c. last 20 years); some hazels with basal shoots getting away where protected by bracken, but repeated browsing of almost all basal shoots suggests all likely to get browsed back over winter/spring. This indicates at least medium term continuity of birch and hazel habitat. Some over-mature and part dead aspen seen, lots of aspen regeneration in some areas, but most kept in check by browsing. Only older willows with vegetative willow regeneration seen. Some planting or protection of oak seedlings/saplings seen. Tree tubes were few in number and scattered in small groups. This provides a short term, immediate solution to issues with regeneration of certain species. However, anything other than periodic small scale successful regeneration events could threaten the condition of the lichen habitat through infilling of glades and shading.	Yes
Freedom from rhododendron	No rhododendron	Visual assessment	As in 2004 and 2010: none seen	Yes
Freedom from exotic regeneration	No exotic regeneration	Visual assessment	As in 2004 and 2010: none seen	Yes



Attribute	Target	Measure	Results	Target met
Occasional light grazing	A balance between no grazing and over-grazing. Maintain the wood pasture habitat, retaining diversity of light/shade, humid and well-ventilated conditions around trees and rocks. No more than 10% ivy and/or bramble present. Hazel stools retaining a vigorous canopy above browsing height.	Visual assessment – ivy being browsed; bramble not choking glades or covering rock outcrops; regeneration of trees and shrubs, including any ‘phoenix’ trees; do collapsed hazel “trees” exhibit viable canopy stems above browsing level; is thicket regeneration compromising the habitat?	<p>Grazing/browsing appears to be light. However, most hazel basal shoots browsed back; a few seen to be &gt;1m tall where protected by bracken, but evidence from stools suggests likely to be browsed back at some point in the near future. Hazel and willow shoots establishing from stems located above browsing level. Aspen saplings mostly suppressed by browsing. However, there is no immediate cause for concern with respect to birch and hazel as there has been successful regeneration in maybe the last 40 years for birch and c. 20 for hazel. There are also a few oak seedlings/saplings protected with tree tubes. It would be desirable to see some of the suppressed aspen seedlings/saplings establish soon. A significant proportion of the site has little current potential for tree regeneration to benefit lichens due to canopy cover and the small glades present are important habitat features. It would be undesirable to encourage a widespread flush of regeneration as this would infill glades leading to negative shading impacts and loss of lichen diversity and abundance. Thicket regeneration has established within the small enclosure but this is insignificant at the site scale.</p> <p>Bramble not seen, ivy very restricted – seen on one birch and starting to climb the trunks of aspen in one of the DMPs.</p>	Yes

Attribute	Target	Measure	Results	Target met
<i>Lobarion</i> communities (WSIEC)	At least 20-30% cover of <i>Lobarion</i> lichens (on ash, elm, willow, oak, rowan and particularly hazel), and present on some boulders. Maintain the <i>Lobarion</i> component of the WSIEC.	Visual assessment – note changes in composition of <i>Lobarion</i> elements of the lichen flora; viability of populations of notable species; changes in woodland structure, presence/absence of lichen habitats/niches by reference to previous surveys/monitoring.	<i>Lobarion</i> cover variable; >50% on the best developed hazel stems. Main spp.: <i>Lobaria pulmonaria</i> , <i>Degelia cyanoloma</i> , <i>Pannaria rubiginosa</i> , <i>Parmeliella triptophylla</i> , <i>Sticta limbata</i> , <i>Collema subflaccidum</i> , <i>Lobaria scrobiculata</i> , <i>Lobaria virens</i> , <i>Nephroma laevigata</i> , <i>Pannaria rubiginosa</i> , <i>Pseudocyphellaria norvegica</i> , <i>Sticta sylvatica</i> , <i>Degelia atlantica</i> , <i>Normandina pulchella</i> . Some low diversity <i>Lobarion</i> on birch and aspen. Nothing to suggest significant change from 2004 and 2010.	Yes
<i>Parmelietum laevigatae</i> community present especially in moderately exposed and well-lit situations, on acid-barked trees such as oak, birch and alder, occasionally also on rocks. (EUOCIEC)	Upland pasture woodland mature oak and birch with at least 40% lichen cover of <i>Parmelietum laevigatae</i> , and at least some <i>Usnea</i> species present. Maintain the EUOCIEC value of the site.	Visual assessment	Frequently poorly developed except on the older birch where cover could be >60% on suitable stems. Generally not that diverse a community with <i>Hypogymnia physodes</i> , <i>Parmelia saxatilis</i> , <i>Pertusaria amara</i> and <i>Ochrolechia androgyna</i> , <i>Parmotrema perlata</i> and <i>P. crinitum</i> . <i>Usnea</i> present on birch twigs and branches. 2010 results noted a small amount of <i>Hypotrachyna taylorensis</i> present but this was not searched for/seen in 2014.	Yes
<i>Graphidion</i> communities present on smooth bark areas of oak, ash, rowan, holly and particularly hazel in peripheral areas (WSIEC)	At least 50% of young hazel stems seen with variously coloured mosaics of crustose lichens (especially in well-lit situations)	Visual assessment – look for slender hazel stems or rowan in well-lit situations with coloured mosaics of crustose lichens	Cover of <i>Graphidion</i> spp. on suitable smooth bark areas of hazel >90%, although species-poor assemblages, and few 'specialist' species noted.	Yes

Attribute	Target	Measure	Results	Target met
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 <i>Lobarion</i> , and loss 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)	As in 2004 & 2010: None seen	Yes
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	As in 2004 & 2010: None seen	Yes
No evidence of atmospheric pollution	No atmospheric pollution effects	A marked loss of <i>Lobarion</i> lichens, or evidence of discoloration or necrosis	As in 2004 & 2010: None seen	Yes

WSIEC = West Scotland Index of Ecological Continuity; EUOCIEC = Eu-Oceanic Calcifuge Index of Ecological Continuity (see Coppins & Coppins, 2002)



*Figure 12. 2010 Fig. 8 exclosure plot, May 2004, one year after exclosure was established. Person shin-deep in mass of new hazel regeneration, with bluebells and some birch regeneration.*



*Figure 13. 2010 Fig. 9 exclosure plot, October 2010: later in the season, so bracken is high, but developing hazel and birch regeneration well established.*





*Figure 14. 2010 Fig. 10 Loch a' Mhuilinn, May 2004. Indirect Monitoring Plot 1a at GR : NC 1657 3954 (as Fig. 4 in Hope et al., 2004);*

*Taken in May 2004, perhaps a year after the exclosure was set up. There is one old stem, and six strong, well-established stems in the stool, and a sheaf of small stick-like regeneration at the base.*



*Figure 15. 2010 Fig. 11 Loch a' Mhuilinn, October 2010, the same stool. Although it is later in the season, the stool is still recognisable six years on. Perhaps one of the main stems on the left has been lost. The basal regeneration has thinned out, and now a few strong, straight stems have reached the canopy, and are generally increasing the vigour and viability of this stool.*



*Figure 16. Appears to be the 2010 Figs 10 & 11 hazel. Photo taken in approx. same direction as 2010 Fig. 10 from NC 16574 39513.*





*Figures 17 and 18. 2010 Figs. 12 & 13, Loch a' Mhuilinn, October 2010: exclosure plot.*

*Further examples of the habitat within the exclosure plot, seven years after it was set up (2003). Successful hazel regeneration, plus birch and (in fig. to right) rowan also seen to be established. At this stage there are still some open areas.*







*Figures 19 and 20. Approximate repeats of 2010 figs 12 and 13. Shows continued establishment of mainly hazel within exclosure plot. Photos taken from top of stile. Stile at NC 16574 39521.*





Monitoring from outside enclosure:



*Figure 21. 2010 Fig. 14 Loch a' Mhuilinn, May 2004 (Fig. 6 of Hope et al., 2004), immediately outside the enclosure, looking ESE (standing by the steps of the enclosure). Scattered hazel, birch and willow, some old (and dead) trees, but well-established young stems on the hazel; also birch regeneration, and the willow is a fairly young tree. Regeneration cluster in foreground at base of dead birch. Grazing levels would appear to be appropriate to maintaining desired upland wood pasture conditions. Lichen interest relatively low at present (recovery phase here?), but good future potential.*



*Figure 22. 2010 Fig. 15 Loch a' Mhuilinn, October 2010: here, outside the enclosure, a similar view to that taken in 2004. The birch has thickened up and does not appear to be browsed by deer. Not visible from this shot – the willow remains viable, and the hazel is possibly now becoming somewhat over-shadowed by robust birch. Some basal shoots of the hazel are browsed, but at least one new sun-shoot has got away to the canopy in recent years.*

*2014: fallen birch now obstructs view of fig. 14 area. Ivy on birch.*





*Figure 23. 2010 Fig. 16 Loch a' Mhuilinn, October 2010: here, outside the exclosure, looking SW from the steps. Later in the season than the 2004 picture, so bracken somewhat obscures fine detail, but birch continues to thrive. Inside the exclosure, the prevalence of the hazel regeneration can be easily appreciated.*



*Figure 24. Approx. repeat of 2010 fig. 16 showing continued success of mainly hazel regeneration. Looking S.*



*Figure 25. 2010 Fig. 17 Loch a' Mhuilinn, October 2010: just beyond the western edge of the exclosure, a sheltered area of scattered hazel stools. These are quite old stools, most reduced to a single thickened stem (forming a hazel 'tree'), as a result of continual browsing of basal shoots. However, most are proliferating quite successfully above browsing height. In this area, most basal regeneration is thwarted by regular deer browsing, quite a contrast to what is occurring within the adjacent exclosure.*





*Figures 26 and 27. 2010 Figs. 18 & 19, Loch a' Mhuilinn, area of IMP2, Oct. 2010: examples of where strong basal regeneration has rejuvenated veteran hazel stools. On both examples, the ancient single "trunk" has fallen horizontally. On the left, a birch is growing out from the right-hand side from the base of the hazel*



*Figure 28. 2010 Fig. 20 Loch a' Mhuilinn, October, 2010:*

*Wood pasture habitat (same location as depicted in Figs. 7–10 of Hope et al., 2004). Scattered 'veteran' hazels in remnant wood pasture habitat. An open sheltered grassy-bracken glade with scattered birch and hazel on a gentle, E-facing slope that levels out to form a broad terrace, before sloping away to the north.*

*The ancient hazel "trees" appear to be strong and viable, with robust canopies above browsing height. Some evidence of successful stool regeneration some years ago is evident from the younger stems. Lichens of the Lobarion community present on the older "trunks", and Graphidion communities on the smooth bark of younger stems.*

*2014: no obvious change, but some sun shoots getting away where protected by bracken. Will be interesting to see if shoots establish or are browsed. DMP 8.*





*Figure 29. 2010 Fig. 21, Loch a' Mhuilinn, May 2004 (Fig. 13 in Hope et al., 2004): a veteran hazel "tree", a characteristic feature of long-term wood pasture. This example has the typical swelling at the base, formed over generations of basal shoots being browsed. The hazel shows decided vigour with strong vertical stems well-established at the bend in the ancient main stem. This hazel "tree" could be well over 100 years old. The lower "trunk" supports lichens of the Lobarion community.*



*Figure 30. 2010 Fig. 22, October 2010: the same hazel; the old 'mother' stem leaning away to the right, is slightly more rotted than in 2004, but otherwise, little has changed.*





**Figure 31.** 2010 Fig. 23 (left), Loch a' Mhuilinn October 2010: another example of a 'veteran' hazel on this fairly extensive linear plateau with open, sheltered grassy glades, scattered birch and hazel, grading away to denser woodland, including oak higher upslope. IMP3 is centred around the wood pasture habitat in the glades on the plateau. This hazel example shows abundant *Lobaria pulmonaria* on the lower trunk, and a good covering of *Graphidion* mosaics on the smooth bark of more sander stems.



**Figure 32.** 2010 Fig. 24 (right) another hazel in this plot, with an example of *Collema subflaccidum* (one of the 'jelly' lichens), overgrowing the crustose lichen *Pyrenula occidentalis*.



Table 9. Attribute and target table for Oceanic, sheltered *Salix carr*. Figures 33-36 show locations surveyed for the Indirect Monitoring assessment in Table 9.

<b>Site:</b>	Loch a' Mhuilinn SSSI
<b>Surveyor(s):</b>	A.M. & B. J. Coppins. A. Griffith
<b>Date of visit(s):</b>	2010 27.09.14

<b>Grid references for sample locations:</b>	
Oceanic, sheltered <i>Salix carr</i>	NGR: c. NC 163 391 NC 16364 39153, NC16323 39153

Attribute	Target	Measure	Results	Target met
Extent	No loss of area of woodland	Visual assessment (mapping/aerial photographs)	As in 2004 & 2010: None detectable.	Yes
Stand structure	Maintain at least a 60–90% canopy cover	Mostly closed canopy, with deeply shaded and dappled light areas	As in 2004 and 2010: High canopy cover (~90%)	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 <i>Salix</i> regenerating by sending up vigorous vertical shoots	As in 2004 and 2010: Procumbent <i>Salix</i> regenerating as described. Stand appears to be maintaining itself.	Yes
Freedom from rhododendron	No rhododendron	Visual assessment	As in 2004 and 2010: None seen	Yes
Freedom from exotic regeneration	No exotic regeneration	Visual assessment	As in 2004 and 2010: None seen	Yes

Attribute	Target	Measure	Results	Target met
Mostly an undisturbed habitat	No evidence of grazing animals within the stand	Visual assessment – cattle or sheep may browse at the edges of <i>Salix</i> 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 snags – acceptable at the periphery, but should be no evidence within the stand.	As in 2004: Minimal grazing - acceptable levels.	Yes
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	As in 2004 and 2010: Boggy areas (naturally fragmented), no extractions for drainage or agriculture; in good condition.	Yes
<i>Lobarion</i> communities present (WSIEC)	At least 20-40% cover of <i>Lobarion</i> lichens present, especially <i>Sticta</i> spp.	Visual assessment – look for tiers of brown lobes ( <i>Sticta</i> spp., smell of fish when rubbed), together with other lichens of the <i>Lobarion</i> community	On suitable stems no obvious change to 2010 description observed: <i>Lobarion</i> 50% cover: abundant & luxuriant. <i>Lobaria pulmonaria</i> . Also noted: <i>Degelia cyanoloma</i> , <i>Lobaria virens</i> , <i>Nephroma laevigatum</i> , <i>Sticta limbata</i> , <i>Leptogium cyanescens</i> , <i>Pannaria rubiginosa</i> ; <i>Pseudocyphellaria norvegica</i> is rare.	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 on branches and twigs, especially in well-lit situations.	Visual assessment – look for pale grey or greenish-coloured foliose lichens; large, thick patches of white or grey crusts; plentiful yellow-grey 'beard' lichens ( <i>Usnea</i> ) on well-lit but sheltered twigs and branches	As in 2004 & 2010: Cover variable from 20% to 40% - low cover of <i>Parmelietum laevigatae</i> due to lack of alder and birch and abundance of <i>Lobarion</i> .  2014: Some spindly birch with c. 20% cover of 'grey lichens'.	Yes

Attribute	Target	Measure	Results	Target met
No evidence of acid rain effects	No loss of <i>Lobarion</i> lichens, or decline of species diversity of <i>Parmelietum laevigatae</i> from previous assessment	Visual assessment – requires assessment by a lichen specialist	As in 2004 & 2010: None seen	Yes
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	As in 2004 & 2010: None seen	Yes
No evidence of atmospheric pollution	A marked loss of <i>Lobarion</i> lichens, or evidence of discoloration or necrosis	Visual assessment	As in 2004 & 2010: None seen	Yes

WSIEC = West Scotland Index of Ecological Continuity; EUOCIEC = Eu-Oceanic Calcifuge Index of Ecological Continuity (see Coppins & Coppins, 2002)



*Figure 33. 2010 Fig. 25 Loch a' Mhuilinn (May, 2004) (Fig. 15 of Hope et al., 2004): habitat within the Salix carr, showing a collapsed willow that is actively regenerating by vigorous vertical arising along the horizontal trunk and branches. Boggy conditions provide localized humidity which is 'trapped' by the canopy, yet sunlight filters through, creating an overall very sheltered, humid and gladed habitat, ideal for a luxurious development of Lobarion lichens.*



*Figure 34. 2010 Fig. 26 October, 2010: (the fallen willow of 2004 is the trunk on the left of this 2010 picture). The degree of collapse is greater, and the mossiness on the trunk, but the overall habitat is certainly viable and self-sustainable.*





**Figure 35.** 2010 Fig. 27 Loch a' Mhuilinn, October 2010: another view of the willow carr habitat. The horizontal trunks with abundant cover of *Lobaria pulmonaria*, whilst the suspended twigs support populations of *Usnea*.



**Figure 36.** 2010 Fig. 28 Loch a' Mhuilinn, October 2010: this is the same mature willow trunk as shown as Fig. 17 in Hope et al., 2004. The bright green satin lichen (*Lobaria virens*) on the right, is very healthy and abundantly fertile. *Lobaria pulmonaria* (left) is also healthy and locally abundant.

## **ANNEX 4: DIRECT MONITORING FORMS AND PHOTOGRAPHS**

This Annex contains all the Direct Monitoring Forms (DMFs) completed in for this site in 2004 (black text), with amendments/ additions in 2010 (red text) and 2014 (blue text). Photographs have only been updated where change was observed. Additional DMFs for new Direct Monitoring Plots set up in 2014 are provided at the end.

**DIRECT MONITORING FORM FOR LICHEN FEATURES:****DMP 1**

**Site:** Loch a' Mhuilinn SSSI      **Date:** 2004  
2010      **Weather:** Overcast, after  
27/09/14      heavy rain  
Bright  
Dry, cloudy

---

**Target species:** *Pseudocyphellaria norvegica*

**Threat status:** LC,IR      **Woodland Status:** WSIEC      **Scarcity:** NS

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**Altitude :** 10–15 m      **NGR:** NC 1636 3915

**Tree:** Grey willow

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**Habitat:** Wet willow woodland between loch and old hazel pasture woodland

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**Abundance:**

Two thalli: the first ~ 12 x 9 cm (including small juvenile outliers); the second, apparently in poor health, ~ 3 x 3 cm. Both located ~ 1.4 m along stem.

2010: the large thallus of *P. norvegica* is no longer present. Several very small fragments (no more than a few lobes each) remain. One (position shown in Fig. 30), is a small, rather slug-chewed piece (growing with *Peltigera hymenina*). Another small patch is on the opposite vertical side of the bough, amongst mosses, with another tiny fragment close by.

2014: no thalli found on target tree or nearby after searching for c. 20 mins. It is possible very tiny thalli could have been overlooked.

---

**Associated species:** (immediate vicinity of *P. norvegica*)

*Degelia cyanoloma* (not seen, 2010), *Lobaria pulmonaria*, *Nephroma laevigatum* (not seen, 2010), *Parmotrema perlatum*, *Sticta fuliginosa* (not seen, 2010), *Usnea cornuta* (not seen, 2010). Also mosses: *Dicranum scoparium* (not seen 2010), *Isothecium myosuroides*, *Orthotrichum* sp. (not seen 2010). *Frullania* sp., new 2010.

---

**Estimated health/viability of population(s):**

The larger of the two thalli apparently expanding, in good health; the smaller in poor health, possibly dying. No apparent threats to habitat. These two thalli somewhat isolated from 'main' populations.

2010: the reasons for the decline in the incidence of *P. norvegica* here is difficult to explain, apart from the fact that there is increased "mossiness" on the bough, which may be out-competing *P. norvegica*.

2014: as for 2010. Stem has collapsed further.

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**Other comments:** A search of 15–20 minutes was made of the immediate vicinity in which no other thalli were seen. Similar in 2010.

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**Photographs:**





*Figure 37.* 2010 Fig. 29 Loch a' Mhuilinn, May 2004, (Figure 1 of Hope et al., 2004). Sprawling willow (looking East, with Loch a' Mhuilinn glimpsed in the background, through the branches); person standing by the willow branch with *Pseudocypbellaria norvegica*.



*Figure 38.* 2010 Fig. 30 October, 2010: the same view as in 2004; the branch with *P. norvegica* has slightly collapsed in the intervening years. The position of *P. norvegica* is shown by the white plastic marker.

**DIRECT MONITORING FORM FOR LICHEN FEATURES:****DMP 2****Site:** Loch a' Mhuilinn SSSI**Date:** 2004  
2010**Weather:** Cloudy but  
brightening  
Fine  
dry, cloudy

24, 27/9/14

**Target species/community:** *Lobarion community*  
*Pseudocyphellaria norvegica***Threat status:** LC,IR**Woodland Status:** WSIEC**Scarcity:** NS**Altitude :** 10–15m**NGR:** NC 1632 3927  
NC 16321 39266**Tree:** Hazel**Habitat:** Old pasture woodland, fairly open with hazel, birch and willow. Grassy/mossy ground layer with bracken.**Abundance:** Present on two adjacent hazels:Tree 1: five thalli/patches, from 2 x 3 cm to 6 x 5 cm; total cover ~120 cm<sup>2</sup>.2010: tree 1 is now quite dead, and no traces of *P. norvegica* remain.Tree 2: seven patches, the largest of irregular shape covering ~400 cm<sup>2</sup>; smaller patches further along stem (the smallest 2cm<sup>2</sup>); total cover ~800cm<sup>2</sup>.

2010: of the three large colonies on the main trunk, two are now gone, with fragments of what appear to be young lobes remaining within the bryophytes in the vicinity. The one remaining large colony appears healthy and robust, although the lobes are all mostly 'mature' (see Fig. 37). On the contorted branch above, six separate patches were seen; again, this seems a dynamic situation, with some patches in the same place as in 2004, whereas others are new and some lost.

2014: Tree 2. c. 18+ patches on main stem – either old and scrappy or new and tiny. Difficult to count as some patches amalgamating.

DMP expanded to examine the frequency of other conspicuous *Lobarion* species on more hazels. Table 10 summarises this information.

Table 10. Frequency of *Pseudocyphellaria* and other conspicuous Lobarion community species on hazel in DMP 2.

Hazel	Grid ref.	<i>Degelia atlantica</i>	<i>Degelia cyanoloma</i>	<i>Lobaria pulmonaria</i>	<i>Lobaria scrobiculata</i>	<i>Normandina pulchella</i>	<i>Pannaria rubiginosa</i>	<i>Parmeliella triptophylla</i>	<i>Pseudocyphellaria norvegica</i>	The 'Skytonema' lichen	<i>Sticta fuliginosa</i>	<i>Sticta limbata</i>	<i>Sticta sylvatica</i>
A	NC 16358 39326	x	x	x		x	x		x	x	x	x	x
B	NC 16354 39324	x	x	x		x	x	x	x	x			x
C	NC 16351 39325		x	x	x	x	x		x				x
D	NC 16348 39327	x	x	x		x	x		x				
E	NC 16348 39327	x		x		x	x						
F	NC 16321 39266		x	x		x	x		x				

Hazel A: at least 6 patches of *P. norvegica*. *Pyrenula occidentalis* present.

Hazel B: One patch of *P. norvegica* observed. Grazing (slug/snail) damage. *Pyrenula occidentalis* present.

Hazel C: At least 4 patches *P. norvegica* present. *Pyrenula occidentalis* present.

Hazel D: At least 1 patch of *P. norvegica*. *Pyrenula occidentalis* present.

Hazel E: No *P. norvegica* found. *Pyrenula occidentalis* present.

Hazel F: Original DMP tree 2. At least 18 patches – difficult to count as amalgamating. *Pyrenula occidentalis* present.

**Associated species:**

*Cladonia pyxidata*, *Degelia atlantica*, *Lobaria pulmonaria*, *Pannaria rubiginosa*; also bryophytes *Frullania tamariscinum*, *Isothecium myosuroides*, *Rhytidiadelphus triquetrus*, *Thuidium tamariscinum*, *Ulota phyllantha*.

**Estimated health/viability of population(s):**

Tree 1: branch is in poor health, dying back in places; some slug grazing to thalli was noted.  
2010: tree 1 now dead

Tree 2: Most patches appear healthy and vigorous; upper patches show some slug grazing.  
2010: some trunk patches gone (fragments remaining), otherwise branch fragments small but viable, with some slug browsing noted.

2014: Dynamic, relatively healthy population

**Other comments:** This DMP could be expanded in future to look at the *Graphidion* community. Hazels examined fairly quickly concentrating on conspicuous species on easy to reach stems.

**Photographs:**





Figure 39. 2010 Fig. 31 Loch a' Mhuilinn May 2004 (Fig. 21 of Hope et al., 2004), showing hazel (1) and hazel (2). White tags show position of *Pseudocypbellaria norvegica* on hazel (1). Birch with thick basal sheaf in the background.

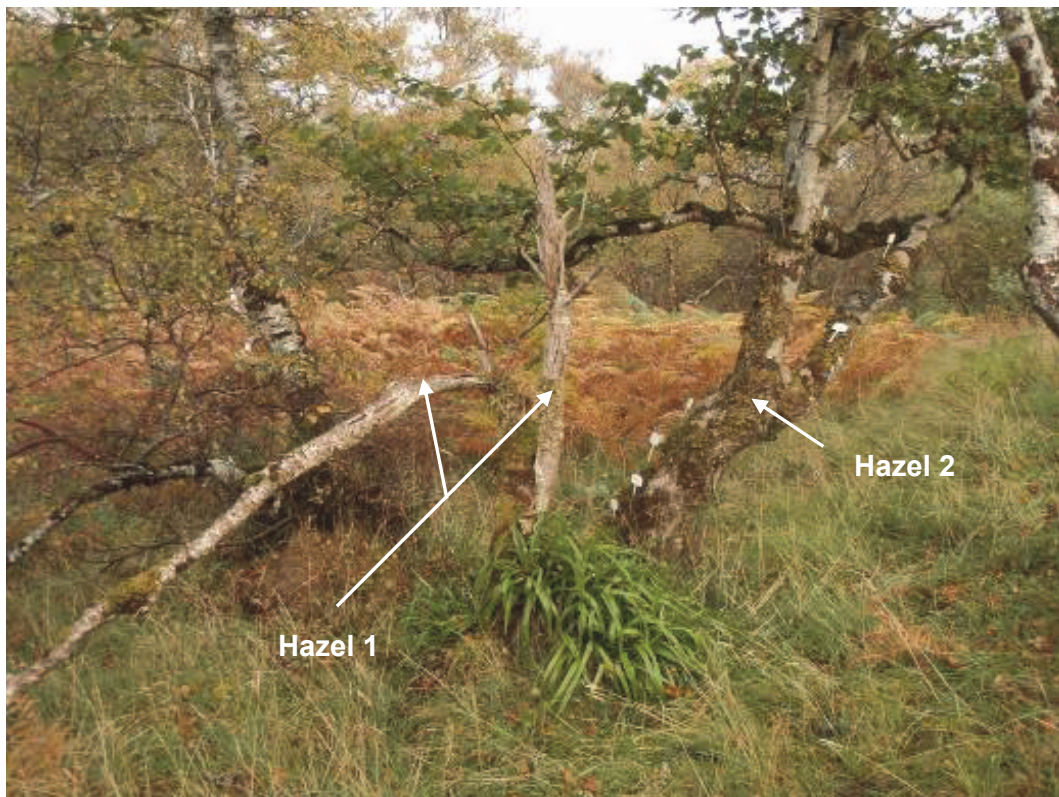


Figure 40. 2010 Fig. 32, October 2010: hazel (1) has died, and *P. norvegica* is no longer present. Hazel (2) still supports several patches of *P. norvegica*. Other changes include increase in tuft of *Luzula sylvatica*, and loss of old mossy stump present in 2004.



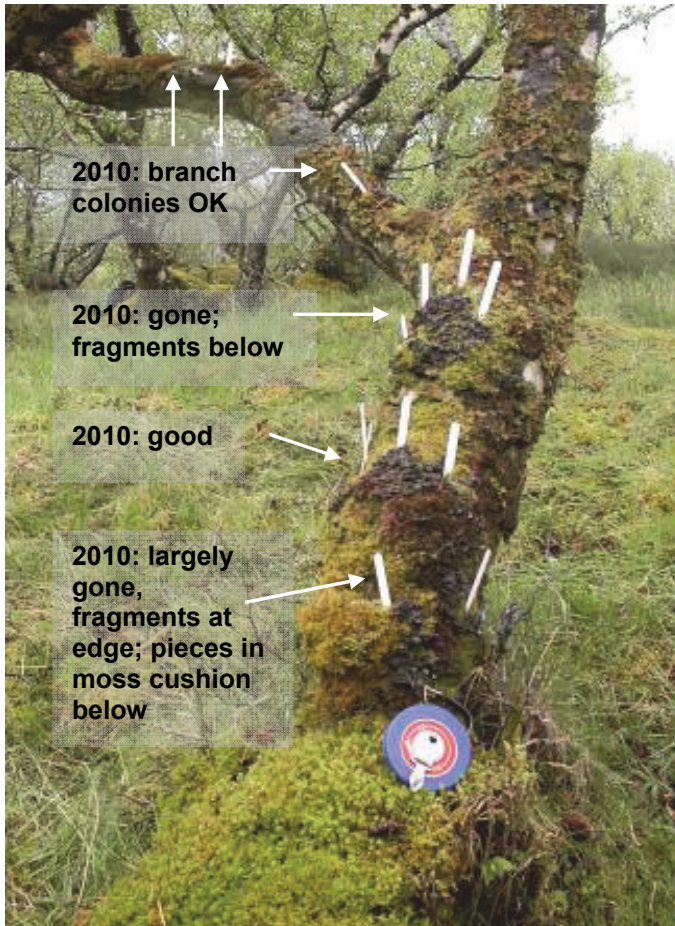


Figure 41. 2010 Fig. 33, Loch a' Mhuilinn, May 2004 (Fig. 22 of Hope et al., 2004).

Hazel (2): the white markers indicate the position of the three main colonies of *Pseudocyphellaria norvegica*, seen as massed dark brown lobes overgrowing bryophyte cushions on the leaning trunk. Three of the five colonies on the upper trunk are also indicated.

Comments relating to what has happened to these patches of *P. norvegica* over the six years are appended.



Figure 42. 2010 Fig. 34, October, 2010.

Hazel (2). White markers again indicate the location of patches of *P. norvegica*.

There are changes in community structure of bryophytes and lichens on the trunk; some bulky bryophyte cushions have fallen away and may be gradually rebuilding, or there could be different species developing here. There will always be a dynamic turnover of epiphytes on trunks, with large patches falling away (or being pulled off by birds), but remaining fragments left behind will often develop into new or large patches.





Figure 43. Approx. repeat of 2010 Fig. 34. White flags mark locations of patches of *P. norvegica*. Hand indicates area with 4+ amalgamating patches. *P. norvegica* still inconspicuous in photo compared to the 2004 photo.

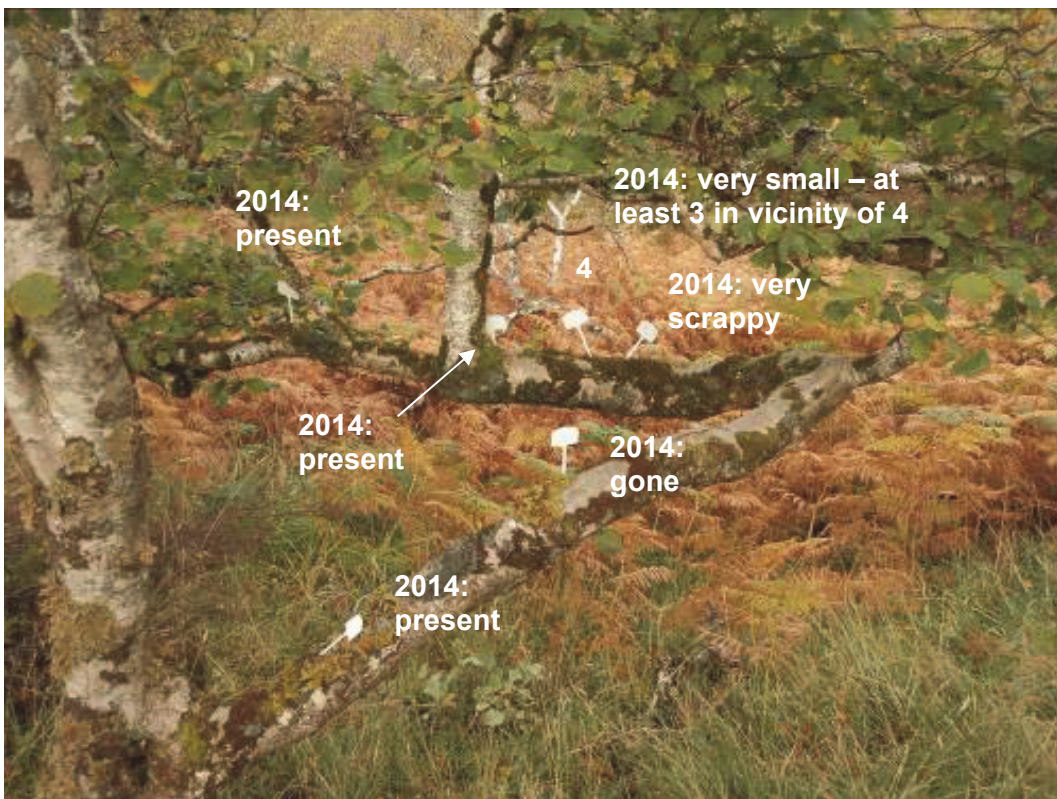


Figure 44. Higher up tree 2 stem. Corner of folder marks location of another thallus of *P. norvegica*.





*Figure 45.* 2010 Fig. 35 Loch a' Mhuilinn, May 2004 (Fig. 23 of Hope et al., 2004), showing the contorted upper branch of hazel (2), and distribution of patches of *Pseudocypbellaria norvegica*.



*Figure 46.* 2010 Fig. 36, October 2010: distribution of patches of *P. norvegica*. Patches 3 & 4 of 2004 appear to be in the same position, but the 2004 patches 1 & 2 are not, suggesting that there is a degree of dynamic loss and recolonization along this stem. Six patches are now identified on this easily identified stem. 2014: again losses and gains.





*Figure 47. Hazel A. Top of pole marks location of one of the patches of *Pseudocypbellaria norvegica*.*



*Figure 48. Hazel B. The two clumps are one hazel.*





Table 11. Frequency of typical birch community spp. on 5 birch in DMP 3.

Birch	Grid ref.	<i>Degelia atlantica</i>	<i>Hypogymnia physodes</i>	<i>Lecanactis abietina</i>	<i>Loxospora elatina</i>	<i>Melanelixia fuliginosa</i> subsp. <i>glabratula</i>	<i>Micarea alabastrites</i>	<i>Micarea stipitata</i>	<i>Ochrolechia androgyna</i>	<i>Parmelia sulcata</i>	<i>Parmelia saxatilis</i>	<i>Parmeliella parvula</i>	<i>Parmotrema crinitum</i>	<i>Parmotrema perlatum</i>	<i>Pertusaria amara</i>	<i>Platismatia glauca</i>	<i>Thelotrema lepadinum</i>	<i>Usnea</i> sp.
A	NC 16428 39654	x		x	x		x	x	x		x	x	x		x		x	x
B	NC 16431 39654		x	x	x	x			x		x	x			x	x	x	x*
C	NC 16433 39655		x						x	x	x				x	x	x	x**
D	NC 16437 39659		x	x	x				x		x	x			x	x		x*
E	NC 16438 39660		x		x					x	x		x		x			

\* *Usnea subfloridana* also present.

\*\* *Kalcbrenneriella cyanescens* on *Usnea* sp.

**Associated species:** –

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**Estimated health/viability of population(s):**

All species more or less healthy, with no apparent threats to viability. 2010: same.

2014: although the monitoring was altered populations appeared healthy with no threats to viability.

---

**Other comments:** This tree chosen more or less at random to represent a typical lichen community on the acid bark of birch. 2010: birch in top of gully recorded

2014: expanded/altered to give an overview of quickly recordable, conspicuous species from a number of trees.

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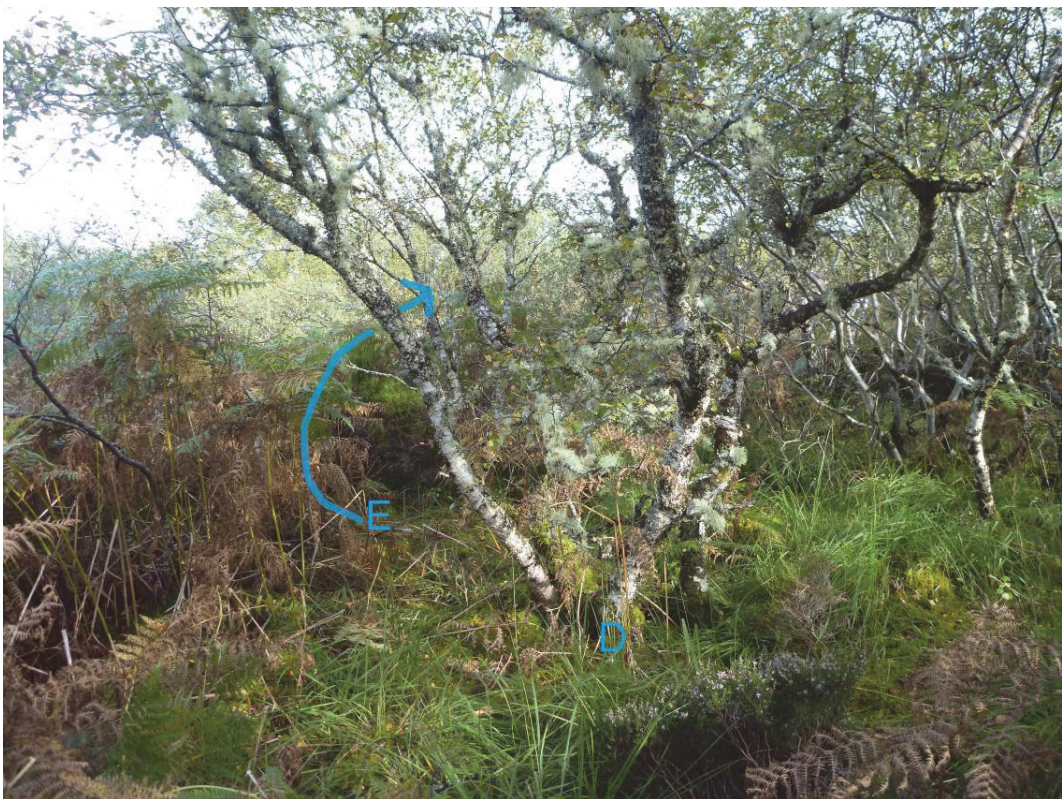
**Photographs:**

None taken 2004 or 2010.





*Figure 51. Location of birch trees A, B and C looking away from the sea.*



*Figure 52. Location of birch trees D and E. E is the 4-stemmed tree behind D at the edge of the bracken stand.*



**DIRECT MONITORING FORM FOR LICHEN FEATURES:****DMP 4**

**Site:** Loch a' Mhuilinn SSSI      **Date:** 2004  
2010  
24/9/14      **Weather:** bright, sunny  
cold and overcast  
cloudy, dry

---

**Target species:** *Pseudocyphellaria crocata*

**Threat status:** LC,IR      **Woodland Status:** WSIEC      **Scarcity:** –

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**Altitude :** 20–25m      Point of reference **NGR:** NC 1645 3963  
birch:      **NGR:** NC 16452 39641

**Tree:** Old leggy stems of *Calluna vulgaris*

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**Habitat:** Damp heathy glade surrounded by low birch and willows.

---

**Abundance:** Population can be seen as occurring in three groups. They are located by a distance and compass bearing from a readily identifiable birch tree, B, growing in the middle of the glade.

Group 1 – located 7.4m @ 020° from B; approximately 20-30 thalli

Group 2 – located 12.2m @ 050° from B; approximately 40-60 thalli

2010: Groups 1 & 2 assessed together, with an estimated 100 thalli of *P. crocata* present, so in healthy and viable populations.

2014: Group 1 (NC 16454 39643) & 2 (NC 16461 39645) assessed together. Estimated 100+ thalli of *P. crocata*. Viable population. Mostly healthy.

Group 3 – located 20.0m @ 166° from B; single thallus only. 2010: not seen, but *Parmeliella parvula* recorded from *Calluna* stems here. 2014: not seen – searched for 5 minutes.

Group 4 – NC 16452 39625. c. 10 thalli on *Calluna*.

---

**Associated species:**

*Degelia cyanoloma*, *Graphis elegans*, *Hypogymnia physodes*, *H. tubulosa*, *Lecanora jamesii*, *Lecanora symmicta*, *Lobaria pulmonaria*, *L. scrobiculata*, *Melanelia subaurifera*, *Mycoblastus caesius*, *Nephroma laevigatum*, *Pannaria rubiginosa*, *Parmelia sulcata*, *Parmeliella parvula*, *Peltigera membranacea*, *Pertusaria pertusa*, *Platismatia glauca*, *Sticta limbata*, *Usnea fragilescens*. 2010: same species present. 2014: A quick search was made to avoid excessive trampling and most of these species were confirmed as present – nothing to suggest loss of diversity. Also recorded: *Degelia atlantica*

---

**Estimated health/viability of population(s):**

Thalli generally in good health. Viability should be assured as long as the heathy glade doesn't become overgrown by trees or shrubs. 2010: same comments apply. 2014: same comments apply.

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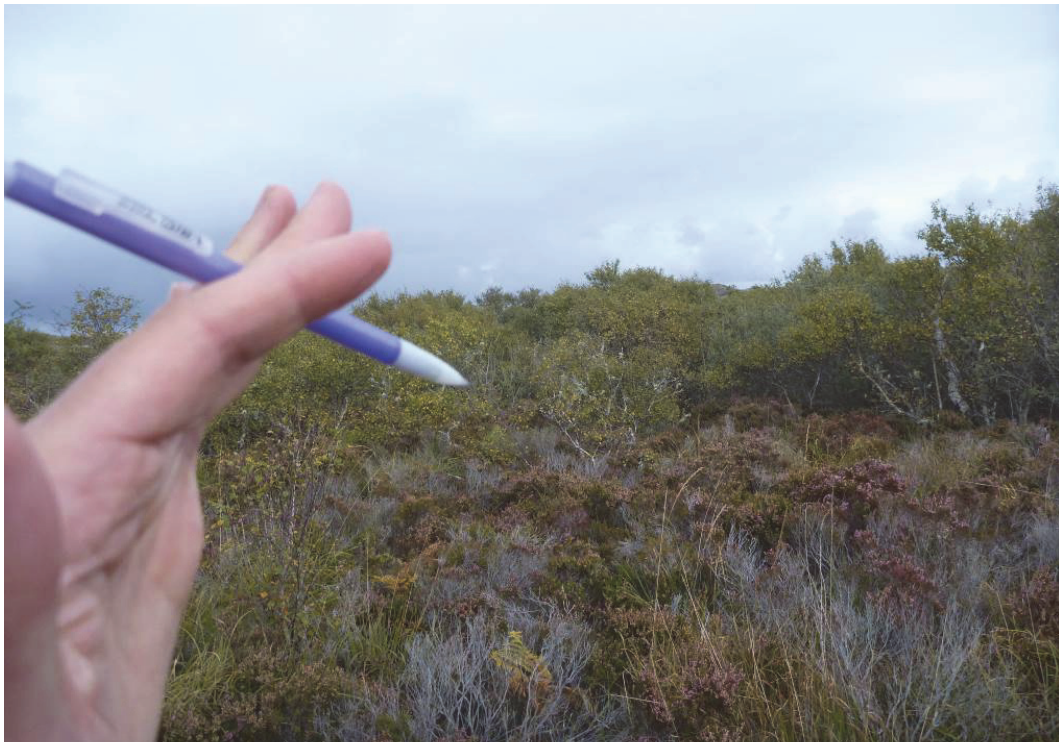
**Other comments:**

This species not seen on any other substrate than *Calluna* stems.

**Photographs:**



*Figure 53. 2010 Fig. 38, Loch a' Mhuilinn, May 2004 (Fig. 25 of Hope et al., 2004). Note the profile of the hills in the background (looking north). The elliptical shape shows the location of a cluster of *Pseudocypbellaria crocata* on *Calluna* stems (Group 1). The arrowed tree is the point of reference birch. The yellow circle shows position of the trident-shaped dead branches of a birch. The location of Group 2 is indicated by ○; and when printed it is possible to see the red marker tied to a branch in this location.*



*Figure 54. Pencil tip indicating location of group 2 behind birch in centre.*



*Figure 55. 2010 Fig. 39, October, 2010: looking north across the open Calluna area; the distant hills profile and (not visible in the photo), the trident-shaped dead birch branches (yellow circle), aid location of Group (1) P. crocata cluster.*





*Figure 56. Location of Group 4 marked by walking pole (centre of photo); woodland profile survey post in foreground.*





*Figure 57.* 2010 Fig. 40, Loch a' Mhuilinn, May 2004 (Fig. 27 of Hope et al., 2004). The red and white tapes denote *Calluna* stems where *Pseudocyphellaria crocata* occurs on the lower, woody stems. The trident-shaped dead birch is circled.



*Figure 58.* 2010 Fig. 41, October, 2010: looking north to the same area. The trident-shaped birch again circled to aid location.





*Figure 59.* 2010 Fig. 42, Loch a' Mhuilinn, October, 2010: parting the *Calluna* to reveal patches of *Pseudocyphellaria crocata* (circled).



*Figure 60.* 2010 Fig. 43, October, 2010: more patches of *P. crocata* (circled), hidden in the *Calluna*.





Figure 61. 2010 Fig. 44, Loch a' Mhuilinn, October, 2010: Parting the Calluna to reveal patches of *Pseudocyphellaria crocata*.



Figure 62. 2010 Fig. 45, October, 2010: a large patch of *P. crocata* hidden in the Calluna.



*Figure 63.* 2010 Fig. 46, Loch a' Mhuilinn, October, 2010: a good patch of *Nephroma laevigatum* on *Calluna*, with *Peltigera membranacea*.



## DIRECT MONITORING FORM FOR LICHEN FEATURES:

DMP 5

## NEW FOR 2010

**Site:** Loch a' Mhuilinn SSSI      **Date:** 2010  
27/09/14      **Weather:** bright,  
dry, cloudy

---

**Target species:**      *Lobaria amplissima*

**Threat status:** LC,IR      **Woodland Status:** WSIEC      **Scarcity:** –

**Tree:** Oak (girth 1.40m)      **Altitude :**      **NGR:** NC 16346.39133

**Habitat:** Mature tree on slight rocky knoll above path at edge of woodland (gladed habitat with mature oak and some rowan, plus veteran hazels, bracken and grasses).

**Abundance:** on one of two oaks here, 2 patches (i) on N-facing side of trunk (20°), @ 1.5m up and just above a low, projecting bough, a patch 23 x 19 cm; abundant cephalodia, and 2 (at least) apothecia. There are several outliers:

2 to right of main patch, 4 x 7 cm; 6 x 5 cm; another, 2 x 3 cm, @ approx 1.75m up from the ground and above & left of the main patch.

(ii) at fork higher up the trunk (approx. 2.5m up), another large patch

2014: on both oaks.

Oak 1: Lower of two main patches (i) present, c. 30 x 25cm. Small patch below this c.3 x 3.5cm. Upper of two main patches (ii) lost/partially lost as limb has broken off. A patch was observed above the damage which may or may not be part of the original patch.

Oak 2: Two patches: upper c. 16 x 8cm, lower c. 2 x 1.5cm.

---

**Associated species:** *Degelia cyanoloma*, *Degelia plumbea* a.str., *Lepraria incana*, *Lepraria lobificans*, *Lobaria pulmonaria*, *Lobaria virens*, *Nephroma laevigatum*, *Peltigera praetextata*

2014: No obvious change.

---

**Estimated health/viability of population(s):** healthy, although slug-grazed in places, and (for the large lower patch), the centre is missing, there is evidence of young regenerating lobes moving back into the empty central space. There was noted a hint of a necrotic patch on one lobe, which may indicate invasion by a lichenicolous fungus.

Predominantly healthy. May be affected by shading from new leafy growth (of oak, see photos). Viability questionable as only seen on these two oaks, further survey would be required to identify other locations.

---

**Other comments:** *Lobaria pulmonaria* very abundant. *Lobaria amplissima* was not found on any nearby trees or shrubs.

2014: No further locations found after a brief search of nearby trees/shrubs. Recommend that future SCM visits aim to find additional locations.

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**Photographs:**





*Figure 64. 2010 Fig. 48 Loch a' Mhuilinn, October 2010: the oak tree with Lobaria amplissima. The two main patches are circled. Oak 1.*





*Figure 65. Approx. repeat of 2010 Fig. 48 showing loss of limb and new leafy growth. Oak 1.*





*Figure 66. 2010 Fig. 49 Loch a' Mhuilinn, October 2010: oak with Lobaria amplissima. This is the lower main patch, at 1.5 m up on the north side of the trunk, just above where a large, low bough comes off the trunk. The shrubby dark-brown lumps are cephalodia. Although the middle has broken away, there is active regrowth of young lobes back into the centre. Oak 1.*



*Figure 67. 2010 Fig. 50 the second large patch of L. amplissima higher up the trunk by a fork in the trunk. Abundant cephalodia also present here. Oak 1.*





*Figure 68. Oak 1: Lower of the two main patches in 2014.*



*Figure 69. Oak 1: Location of patch in vicinity of the upper of the two main patches noted in 2010.*





*Figure 70.* Oak 2. Oak 1 is the tree immediately behind and to the left. *Lobaria amplissima* patches were observed in the area circled in orange.





Figure 71. Location of the 2 patches of *Lobaria amplissima* observed on oak 2 in 2014.



**DIRECT MONITORING FORM FOR LICHEN FEATURES:****DMP 6****NEW FOR 2010**

**Site:** Loch a' Mhuilinn SSSI      **Date:** 2010  
27/09/14      **Weather:** bright  
dry, cloudy

---

**Target species:**      *Pseudocyphellaria norvegica*

**Threat status:** LC,IR      **Woodland Status:** WSIEC      **Scarcity:** NS

**Tree:** veteran hazel      **Altitude :**      **NGR:** NC 16296.39266

**Habitat:** gradual SE-facing slope leading up from the pasture woodland area of IMP3. The hazel is an old veteran stool, leaning downslope. (There are two oak trees higher up the slope which will guide re-finding this hazel).

**Abundance:** One good-sized patch on the vertical side of the lower "trunk" of this hazel.

2014: small patches on lower 'trunk' of hazel – see Figures 72 to 75.

---

**Associated species:** *Lobaria pulmonaria*, *Lobaria virens*, *Degelia cyanoloma*.

2014: no obvious change.

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**Estimated health/viability of population(s):** slightly precarious position, on the vertical side of the leaning hazel; the *P. norvegica* is mostly closely associated with bryophytes – if they peel away, then they will take the *P. norvegica* with them. If this does occur, some small fragments of lobe of *P. norvegica* may remain, which would regenerate to form new thalli. Otherwise, this patch of *P. norvegica* appears healthy, although most lobes seem large and mature, with plenty of soredia (vegetative propagules). How successful these propagules are at establishing and beginning a new population will be important for the future of this species at Loch a' Mhuilinn.

2014: Some loses and gains. Mostly healthy. Population across site appears to be viable.

---

**Other comments:** A nearby leaning oak (NC 16318 39292) was noted as supporting four patches of *P. norvegica*.

Recommend that in future this DMP is subsumed into DMP 2 – a list of other *Lobarion* spp. present would be required.

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**Photographs:**



Figure 72. 2010 Fig. 52 Loch a' Mhuilinn, October, 2010: leaning hazel (thallus of *Pseudocyphellaria norvegica* circled). Note browsed regeneration at base of the hazel.



Figure 73. 2010 Fig. 51 Loch a' Mhuilinn, Oct. 2010: *Pseudocyphellaria norvegica* (with *Lobaria pulmonaria*) on the leaning hazel.





Figure 74. *Pseudocyphellaria norvegica* (at the location circled in 2010 Fig. 50) in 2014.



*Figure 75. Lower section of hazel showing browsed basal shoots for comparison with 2010 Fig. 50 (inconclusive) and future monitoring. Note one of the basal shoots is above height of surrounding bracken.*





Figure 76. 2010 Fig. 53 the “upper” part of the leaning hazel (seen above), showing raggedy lobes of *Lobaria pulmonaria*, and the smoother, satiny lobes of *Lobaria virens*.



Figure 77. Oak tree supporting *Pseudocyphellaria norvegica*.





*Figure 78. Location of lower *P. norvegica* patches. Yellow dot in this photo and fig. 79 marks the same location on trunk.*



*Figure 79. Location of upper *P. norvegica* patch (above finger). Yellow dot in this photo and fig. 78 marks the same location on trunk.*



**DIRECT MONITORING FORM FOR LICHEN FEATURES:**

**DMP 7**

**NEW FOR 2014**

**Site:** Loch a' Mhuilinn SSSI

**Date:** 24/9/14

**Weather:** dry, cloudy

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**Target community:** Typical birch community (conspicuous spp. only)

**Tree:** old birch

**Altitude :-**

**NGR:** various birch A at NC  
16598 39542; birch H at NC  
16577 39538

**Habitat:** Along burn and slopes above. Near woodland profile post 8.

**Abundance:** See Table 12 for frequency of species on 10 trees.

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Table 12. Frequency of *Lobarion* spp. on 10 trees.

Birch	<i>Cladonia</i> sp.	<i>Degelia atlantica</i>	<i>Degelia cyanoloma</i>	<i>Evermia prunastri</i>	<i>Hypogymnia physodes</i>	<i>Hypotrachyna laevigata</i>	<i>Lecanactis abietina</i>	<i>Loxospora elatina</i>	<i>Normandina pulchella</i>	<i>Ochrolechia androgyna</i>	<i>Pannaria rubiginosa</i>	<i>Parmelia saxatilis</i>	<i>Parmelia sulcata</i>	<i>Parmeliella parvula</i>	<i>Parmotrema crinitum</i>	<i>Parmotrema perlatum</i>	<i>Pertusaria amara</i>	<i>Platismatia glauca</i>	<i>Pyrenula occidentalis</i>	<i>Usnea</i> sp.	<i>Melanelixia fuliginosa</i> subsp. <i>glabratula</i>	
A										X					X					X*		
B	X				X			X		X**		X			X		X					X
C	X							X		X		X										X
D	X			X	X					X		X	X		X		X	X		X		X
E										X		X					X			X		X
F	X									X												X
G	X								X					X								X
H	X	X	X						X	X	X	X			X	X	X		X			X
I	X							X		X		X			X				X			X
J						X	X								X		X					X



Birch A: \* = *Usnea wasmuthii*

Birch B: *Arthonia analepta* also present. \*\* fertile *Ochrolechia androgyna* present.

Birch H: *Pertusaria leioplaca* and *Peltigera membranacea* also present

Birch A – older, snapped birch

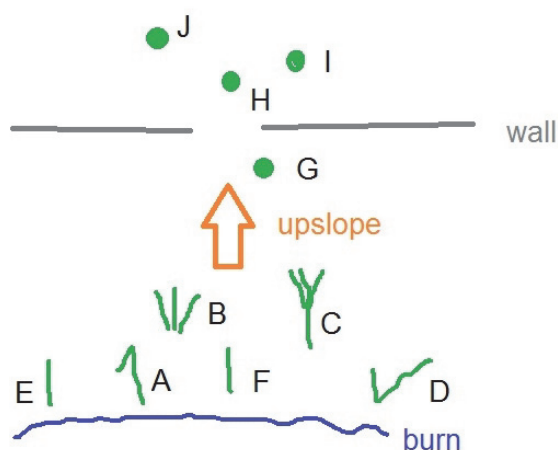
Birch B – 3 stemmed birch

Birch C – birch with trunk branching into 3 main stems

Birch D – by burn

See Figures 80 and 81 for locations.

Figure 80. Sketch map of relative locations (approximate):



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**Associated species:** some *Lobarion* spp. seen.

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**Estimated health/viability of population(s):** Healthy and viable with younger birch in vicinity. Younger birch around upper group of monitoring trees with no leafy grey lichens or conspicuous crustose species. These have the potential to provide continuity of habitat. However, some clumps of young birch are quite dense and shading may affect development of this community i.e. shading can lead to lower cover and diversity. Long term monitoring will reveal whether or not this is an issue.

Young birch adjacent to tree.

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**Other comments:**

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**Photographs:**



*Figure 81. Location of birch trees A, B, D, E and F. Others are upslope as per sketch map (figure 80).*



## NEW FOR 2014

Site: Loch a' Mhuilinn SSSI Date: 24/09/14 Weather: dry, cloudy

Target community: *Lobarion, Graphidion*

Tree: hazel

Altitude :

NGR: various see table 13

Habitat: stand of old hazel on gentle east facing slope (2010 Fig. 20).

Abundance: Frequency of *Lobarion* spp. on 5 trees recorded in table 13.

Table 13. Frequency of *Lobarion* spp. on 5 hazel at DMP 8.

Hazel	Grid ref.	<i>Collema subflaccidum</i>	<i>Degelia atlantica</i>	<i>Degelia cyanoloma</i>	<i>Lobaria pulmonaria</i>	<i>Normandina pulchella</i>	<i>Pannaria rubiginosa</i>	<i>Parmeliella triptophylla</i>	<i>Pyrenula macrospora</i>	<i>Pyrenula occidentalis</i>	<i>Thelotrema lepadinum</i>	<i>Thelotrema petraeoides</i>	The 'Scytonema' lichen
A	NC 16508 39602	x		x	x	x		x		x	x		
B	NC 16507 39606			x	x	x				x	x		x
C	NC 16511 39602		x		x	x	x		x	x		x	
D	NC 16502 39602				x					x		x	
E	NC 16506 39596		x	x	x	x				x	x		

Associated species:-

**Estimated health/viability of population(s):** Population healthy and viable. Some sun shoots getting away where protected by bracken- may get browsed back over winter. Some shoots need to establish periodically (as and when canopy gaps allow) to ensure continuity of habitat. It is unclear whether current browsing levels are permitting this to happen at this location – further monitoring would be required.

**Other comments:** The birch in 2010 Fig 18/19 supports *Degelia atlantica*, *Normandina pulchella*, *Lobaria pulmonaria*.

Limited time was available for searching hazels for the less conspicuous *Graphidion* spp. This DMP could be expanded to include more species from this community.

Photographs:-



*Figure 82. 2010 Fig. 20. Shows monitoring trees A (centre), B (left) and C (right).*



*Figure 83. Repeat of 2010 Fig. 20 to indicate where some sun shoots are getting away where protected by bracken – level with top of walking pole. It will be interesting to see whether shoots establish or are browsed in future.*





*Figure 84. 2010 Fig. 18. Shows monitoring trees D. Monitoring tree E is adjacent to this hazel.*

**DIRECT MONITORING FORM FOR LICHEN FEATURES:**

**DMP 9**

**NEW FOR 2014**

**Site:** Loch a' Mhuilinn SSSI      **Date:** 24/09/14      **Weather:** Dry, cloudy

**Target community:** Typical birch community

**Tree:** birch      **Altitude :**      **NGR:** various see Table 14

**Habitat:** stand of birch on side of knoll.

**Abundance:** Frequency of *Parmelion* spp. on 5 trees recorded in Table 14.

Table 14. Frequency of *Parmelion* spp. on 5 birch at DMP 9.

Hazel	Grid ref.	<i>Lecanactis abietina</i>	<i>Loxospora elatina</i>	<i>Melanelixia fuliginosa</i> subsp. <i>glabratula</i>	<i>Micarea stipitata</i>	<i>Ochrolechia androgyna</i>	<i>Parmeliella parvula</i>	<i>Parmelia saxatilis</i>	<i>Parmotrema crinitum</i>	<i>Parmotrema perlatum</i>	<i>Pertusaria amara</i>	<i>Thelotrema lepadinum</i>
A	NC 16485 39603			x						x		
B	NC 16487 39598			x		x		x				
C	NC 16490 39598		x	x		x	S	x				
D	NC 16487 39604	x		x	S	x					x	
E	NC 16487 39604	x		x	x	x		x				x

B also supports *Degelia cyanoloma* and *Lobaria pulmonaria*

D also supports *Lobaria pulmonaria*

E is downslope of D.

**Associated species:-**

**Estimated health/viability of population(s):** Population healthy and viable. Might expect diversity and abundance of species to increase as birch age.

**Other comments:** The birch in 2010 Fig 18/19 supports *Degelia atlantica*, *Normandina pulchella*, *Lobaria pulmonaria*.

The *Parmelion* is not that well developed. Many of the mature birch on the site are not that old and presumably represent a flush of regeneration (possibly mainly vegetative)



establishing as a result of management changes. See DMP 7 for some of the older birch seen on site.

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**Photographs:**

Order of trees from roughly S to N: C, B, A, D, E.



*Figure 85. Location of birch trees C and B*



*Figure 86. Location of birch trees A, D and E*



**DIRECT MONITORING FORM FOR LICHEN FEATURES:**

**DMP 10**

**NEW FOR 2014**

**Site:** Loch a' Mhuilinn SSSI

**Date:** 24/09/14

**Weather:** Dry, cloudy

**Target community:** *Lobarion*

**Habitat:** small stand of younger mature aspen on steep rocky heathery slopes above lochan.

**Abundance:** Frequency of *Lobarion* species on 4 aspen recorded in Table 15. Typically small patches seen – sparse cover and low diversity.

Table 15. Frequency of *Lobarion* spp. on 4 aspen at DMP 10.

Hazel	Grid ref.	<i>Degelia</i> sp.	<i>Normandina pulchella</i>	<i>Pannaria rubiginosa</i>	<i>Parmeliella triptophylla</i>	<i>Sticta sylvatica</i>
A (tagged 0129)	NC 16423 39455		x	x	x	
B (tagged 0130)	NC 16423 39454			x		
C	NC 16421 39449	x		x	x	
D	NC 16419 39448				x	x

A: Also supports *Megalania grossa*.

B: Has patches of red and green paint on trunk.

C: Ivy to c. 60cm. Tiny lobes of *Degelia* – not possible to identify to species.

D: Also supports *Leptogium tristicula*.

**Associated species:** -

**Estimated health/viability of population(s):** healthy, viable as aspen not the only tree species supporting this community. Will be interesting to see if *Lobarion* community on these aspen becomes more diverse.

**Other comments:** In future cycles additional aspen near these and elsewhere on the site could be included.

**Photographs:**



*Figure 87. Location of aspens A (centre), B (right) and C (left). D is not shown but it is the next nearest aspen to C.*



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