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Monitoring recommendations for Marsh Saxifrage (*Saxifraga hirculus* L.) in the Republic of Ireland

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Monitoring recommendations for Marsh Saxifrage (*Saxifraga hirculus* L.) in the Republic of Ireland

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Cover photo: *Saxifraga hirculus* © C.S. Muldoon

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Executive Summary

A perennial herbaceous plant with a wide circumpolar distribution, *Saxifraga hirculus* L. has a highly fragmented distribution outside the northern Polar Regions. In Europe, its range has been reduced dramatically with records from the 19th century showing the loss of habitats, mainly due to habitat degradation and fragmentation, afforestation and drainage. Given its restricted distribution, Ireland has an international responsibility to protect this species through its designation under Annex II and Annex IV of the EC Directive 92/43/EEC (EU Habitats Directive).

In Ireland, where it once occurred in many locations across the midlands, north and northwest, it is now found only in one site in the Garron Plateau, Co. Antrim, at nine sites (with eighteen populations) in northwest Co. Mayo and one site in Co. Sligo. Restricted to mineral flushes in what is otherwise ombrotrophic blanket bog, it is one of the rarest flowering plants in Ireland.

A study of populations in the flushes and surrounding bog at the Co. Mayo sites recorded the vegetation composition and abundance and a range of other environmental variables. Analysis of these and other data was carried out to identify positive and negative indicators for the optimal growth of *S. hirculus* and the health of its flushes. Grazing levels and vegetation height were identified as important factors, as were the abundance or presence/absence of certain other plant species as positive/negative indicators.

Monitoring methods were developed and conservation assessments were undertaken for each population of *S. hirculus* surveyed.

Acknowledgements

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This *Irish Wildlife Manual* is published posthumously after the passing of Dr Caoimhe Muldoon and this volume is dedicated to her memory and to her family.

May she rest in peace.

1. Introduction to *Saxifraga hirculus*

1.1. Description of *Saxifraga hirculus*

In Ireland, the flowering shoot of *Saxifraga hirculus* can vary in height from 4–35 cm with up to 7 flowers, although 2–3 are more common (Muldoon, 2011). The petals are bright yellow with orange spots near the base (Figure 1 (c)). The ovary is superior and sepals are turned downwards. Leaves are alternate and oblong in shape, with long stalks on the lowest leaves (Webb *et al*., 1996).

S. hirculus can reproduce sexually by insect pollination (Olesen & Warncke, 1989) with gravity-dispersed seeds, or clonally by means of slender rhizomes formed from decumbent stems (normally 1–5) (Olesen & Warncke, 1990). Moss often covers these rhizomes which decay after one season thus separating ramets (Welch, 1993).

Figure 1. Different stages of *Saxifraga hirculus* from (a) leafy rosette through the stages of the flowering stem, (b) bud, (c) flower and (d) seedhead.

The density of rosettes varies from flush to flush, ranging from sites where the rosettes carpet the ground to sites with more sporadic patches. The first flowering stems appear in mid-July with

flowering ending in early September. The majority of seed capsules matures and dehisces in the first weeks of September.

S. hirculus in North West Ireland has moderately high levels of genetic diversity when compared with other studies of rare plants in Ireland (Muldoon, 2011). On a population level, two groups appear to emerge with a river system acting as an incomplete barrier to geneflow. The possible existence of a large number of genets identified in a relatively small area would indicate that sexual reproduction is occurring and the lack of correlation between population size and genetic diversity emphasizes the importance of maintaining all known *S. hirculus* sites.

Although easily identified when in flower, the small rosettes can often be overlooked in the vegetative state, and field training is required for undertaking surveys out of flowering season.

1.2 Global distribution of *Saxifraga hirculus*

S. hirculus has a circumpolar distribution in the northern hemisphere, with extensions south to the Himalayan region (Webb & Gornall, 1989; Hultén, 1962; see Figure 2). Outside the Northern Polar regions, *S. hirculus* is highly fragmented and has experienced a sharp decline in the 19th century due to a variety of reasons including habitat degradation and fragmentation, afforestation, drainage and overgrazing (Vittoz *et al*., 2006; Warncke, 2003; Lockhart, 1989; JNCC, 2010).

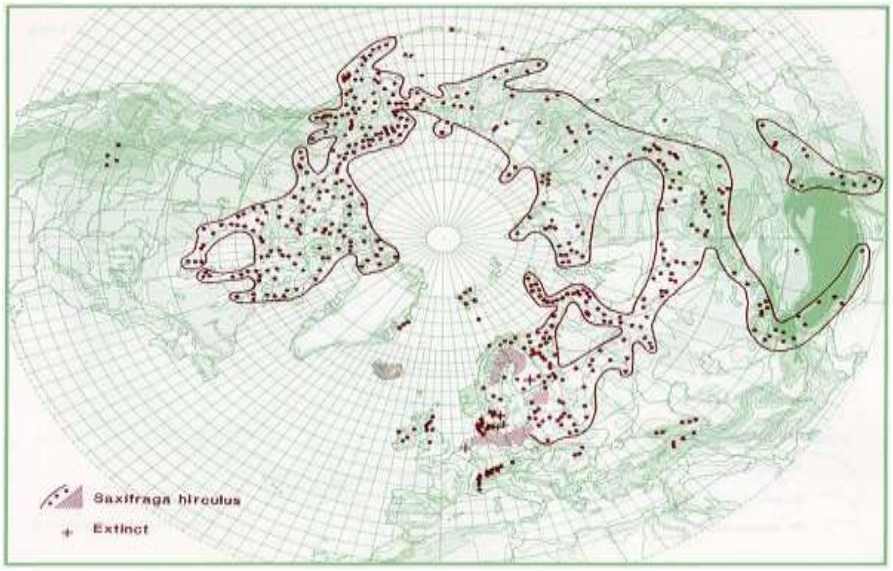

Figure 2. Worldwide distribution of *Saxifraga hirculus* taken from Hultén (1962).

This trend is well documented across Europe with the species now extinct in Austria, the Czech Republic and the Netherlands (Jalas *et al*., 1999). Severe depletion has been documented in other countries such as Switzerland, where 27 sites were reduced to 1 by the 1960s (Christe *et al*., 1990; Kaesermann & Moser, 1999), and France, where 25 sites were reduced to 3 (Hallam *et al*., 2005). In the UK, over 20 sites containing *S. hirculus* were recorded from 13 vice-counties (Preston *et al*., 2002), but

the plant is now restricted to around 20 sites in approximately ten 10 km squares throughout Northern Ireland, Scotland and northern England. The northern Pennines in England hold the main concentration of sites, with 80–90% of the UK population (www.ukbap.org.uk). Scotland has six sites with only four sites recorded in the past 80 years (Welch, 1995).

1.3 Irish distribution of *Saxifraga hirculus*

In Ireland, *S. hirculus* had a much broader altitudinal range when recorded by Praeger in 1937, however it is now considered (in common with most of Northern Europe) to be a montane species due to the loss of its lowland habitats. Previously, *S. hirculus* was more widespread throughout the country with sites in a number of midland counties including Tipperary, Westmeath, Offaly, Laois (Moore & More, 1886; Praeger, 1937) and Meath (Herbarium specimen, Manchester), as well as being found in five sites in Northern Ireland in Counties Derry and Antrim (Moore & More, 1886). It is currently one of the rarest flowering plants in Ireland (Lockhart, 1989). The Irish Red Data book (Curtis & McGough, 1988) reported only two extant sites, one in Mayo and one in Antrim. The midlands sites have been lost due to drainage and peat removal (Lockhart, 1989**)**. Since then, additional sites have been located in Mayo by the National Parks and Wildlife Service (Lockhart, 1989; unpublished NPWS records).

This report was compiled in 2011. At that time *S. hirculus* was recorded from 13 populations at 8 sites in the Republic of Ireland, all in County Mayo. More recent discoveries of six new populations of *Saxifraga hirculus* (including one population in Co. Sligo) are included as part of the updated national conservation status assessment; this can be accessed at http://www.npws.ie/sites/default/files/publications/pdf/Article_17_Web_report_species_v1.pdf.

Changes in the distribution and assessment of European populations of *Saxifraga hirculus* are detailed at the following address: http://bd.eionet.europa.eu/article17/reports2012/species/report/.

Table 1 lists the site name, SAC name and code and grid references for the thirteen populations in Co. Mayo considered in this report. Figure 3 shows the location of each site in Ireland.

Detailed site descriptions and further information can be found in Muldoon (2011).

Table 1: Extant *Saxifraga hirculus* populations in Ireland considered in this study, all located in County Mayo.

Site	**SAC name (code)**	**Grid reference**
Sheean A	Owenduff/Nephin Complex (IE000534)	F91972 20034
Sheean B	Owenduff/Nephin Complex (IE000534)	F92028 20085
Sheean C	Owenduff/Nephin Complex (IE000534)	F91760 19919
Sheean D	Owenduff/Nephin Complex (IE000534)	F92114 20180
Uggool	Owenduff/Nephin Complex (IE000534)	F92546 18935
Largan Mor A	Carrowmore Lake Complex (IE000476)	F89371 22564
Largan Mor B	Carrowmore Lake Complex (IE000476)	F89922 24056
Sheskin A	Bellacorick Bog Complex (IE001922)	F98134 29147
Sheskin B	Bellacorick Bog Complex (IE001922)	F98457 28809
Bellacorick	Bellacorick Iron Flush (IE000466)	G00613 24707
Formoyle	Bellacorick Bog Complex (IE001922)	G05400 22300
Barroosky	Carrowmore Lake Complex (IE000476)	F93575 28595
Aghoo	Glenamoy Bog Complex (IE000500)	G08312 35099

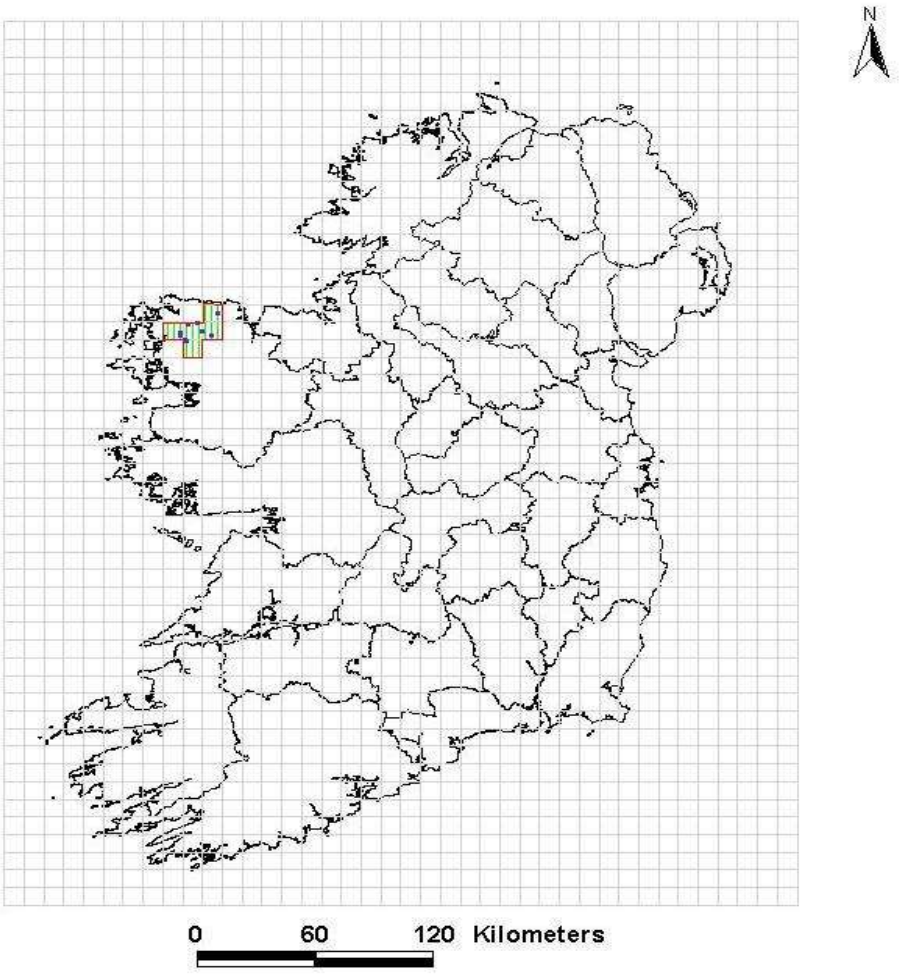

Figure 3. 2011 distribution of *Saxifraga hirculus* in the Republic of Ireland. Blue dots indicate individual sites and are enclosed in 10 x 10 km squares.

The sites on the Garron Plateau, Co. Antrim (Northern Ireland) have been affected by similar threats resulting in two of the three sites identified by Praeger (1920) being lost. *S. hirculus* is now recorded from only one location on the Garron Plateau in Co. Antrim (Praeger, 1920; Wolfe-Murphy, 1996; Kelly, 2000).

1.4 Habitat of *Saxifraga hirculus*

In Ireland, *S. hirculus* is found to be restricted to mineral flushes in blanket bog. Flushes are areas of rising groundwater seepage found in bog and generally on sloping ground. The groundwater forms small streams which are the principle source of electrolytes and other minerals to the flushes (Kelly, 2005), which allow plants not normally found in an ombrotrophic bog to flourish. The peats are iron-stained with a rusty red ferric iron precipitate and the flushes are generally small and are often linear. These flushes are visible to the naked eye in aerial photographs, or on the ground for some distances, due to the contrasting brown/purple of the bog and the green colour of the various herbs, grasses and sedges abundant in the flushes.

Figure 4. Example of a flush in Co. Mayo containing *Saxifraga hirculus*.

Commonly associated herbaceous species with *S. hirculus* in Ireland include: *Anthoxanthum odoratum, Anagallis tenella, Epilobium palustre, Potamogeton polygonifolius, Galium palustre, Holcus lanatus, Lychnis flos-cuculi, Molinia caerulea, Potentilla palustris, Vaccinium oxycoccos, Juncus bulbosus, Cardamine pratensis, Equisetum palustre* and *Ranunculus flammula.* Bryophyte cover is extensive and includes such species as *Calliergonella cuspidata, Aulacomnium palustre, Tomentypnum nitens, Hylocomium splendens* and various *Sphagnum spp.* (Lockhart, 1989; NPWS records).

2. Conservation obligations

Given its restricted distribution, Ireland has an international responsibility to protect this species. It is listed on Annex II and Annex IV of the EC Directive 92/43/EEC (EU Habitats Directive). Species listed on Annex II of this Directive are afforded protection through the designation of populations within Special Areas of Conservation. Any plans, projects or activities proposed within these areas require appropriate assessment under Article 6 of the Directive to ensure they will not negatively impact the species. Species listed on Annex IV of the Directive are strictly protected under Article 13 which details that it is prohibited to deliberately pick, collect, cut, uproot or destroy any plants within their natural range. The species is also protected nationally under the 1999 Flora (Protection) Order (Irish Statue Book, 1999) which additionally protects the habitats in which they occur.

All species listed on the Habitats Directive must be maintained or restored to Favourable Conservation Status. The conservation status of a species is perceived to be favourable when:

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats,
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long term basis.

3. Monitoring of *Saxifraga hirculus* in the Republic of Ireland

Article 11 of the Habitats Directive obliges Member States to undertake surveillance/monitoring of the conservation status of all species listed on the Directive. The assessment of conservation status is reported to the EU every 6 years as required under Article 17 of the Directive. The updated methodology for the national assessment of conservation status has been drawn up by the European Topic Centre for Nature Conservation (ETCNC) and EU Member States in 2011. The format for the national assessment of conservation status for species brings together information on four attributes for each species: Range, Population, Habitat for the Species and Future Prospects. Each attribute is assessed following a rules-based approach as being "favourable" (good), "unfavourable – inadequate" (poor), "unfavourable – bad" (bad) or "unknown". Good, poor and bad assessments are colour-coded Green, Amber and Red respectively. Green assessments mean that the species is stable and unlikely to be impacted by pressures; a Red assessment is given where declines and impacts affect the long term viability; an Amber assessment falls between the two extremes.

For *Saxifraga hirculus*, the approach has been scaled down to a site-based assessment. The relevant sections of the assessment, described in the Methods below, are for the Population, Habitat for the Species and Future Prospects attributes; the results are combined to provide an overall assessment for each site.

- 'Population' assesses the number of individuals and whether a population is reproductively viable.
- 'Habitat for the Species' assesses the area and quality of the habitat in which the species occurs.
- 'Future Prospects' are assessed by examining whether any activities are affecting the other attributes (i.e. Population and Habitat for the Species) and what their impact would be if they continue unchecked. Future Prospects should balance any positive and negative activities to determine whether the species will survive at each site for the foreseeable future.

Following detailed research into the ecology of the species (Muldoon, 2011), a suite of indicators and targets were derived to assess each attribute. As there is no evidence of a decline in the area or density of the populations from previous surveys (NPWS) many of the current values have been set as target values.

Full field methodologies and assessment methodologies for ongoing monitoring are detailed in sections 4 and 5.

4. Pre-survey

Prior to the survey being carried out, the surveyor should insure they have the necessary skills to identify *S. hirculus* in both flowering and vegetative states.

Field survey equipment should include:

- An adequate number of site assessment sheets (see Appendix I)
- Maps showing location of sites (see Appendix III)
- A handheld GPS receiver capable of differential corrections accurate to 50 cm or less with post processing (e.g. Trimble GeoExplorer range)
- Site polygons downloaded to the GPS receiver
- 2 meter bamboo canes (approx. 10)
- 1 m^2 quadrats subdivided into 25 cm^2 quadrats
- A waterproof field notebook
- Plant identification guides
- Thorough familiarisation with previous surveys of the site under investigation - this will highlight any changes in status or threats from the previous visits (see Appendix II).

Note: Care should be taken during all visits to minimise impact on these sites. Many of these flushes contain vulnerable and highly localised bryophytes and other vascular plants.

5. Methodology

5.1 Section A: Population Assessment

Methods for assessing the population of *S. hirculus* have often been based on flower heads alone. However, this method is likely to severely underestimate a population as many rosettes do not support a flowering stem and count numbers will depend on the timing of the visit. Therefore, methods for estimating the number and density of *S. hirculus* are proposed, in addition to flowering head counts. Table 2 gives an example of a completed Population Assessment section. The details of how to assess each category are also outlined below.

Table 2: Population Assessment indicators and targets for *Saxifraga hirculus.*

Indicator	Target	Result	Pass/Fail
Total number of rosettes	> 2,800	> 2,800	Pass
Density of rosettes	The mean number of *Saxifraga hirculus* rosettes should be > 30 when recorded in five or more 1 m² relevés	> 30	Pass
Number of flowering heads	> 1,000s	1,000s	Pass

5.1.1. Total number of rosettes and density of rosettes

The distribution and density of *S. hirculus* varies across the different sites. For instance, in sites like Sheean and Uggool, rosettes carpet the ground and a distinct area can be measured out. However, in Sheskin B and Bellacorick, small clumps occur and these may be quite isolated within the site. For this reason, two approaches for population assessment are proposed here. The overall aim of these approaches is to generate a set of standardised and comparable data that can be used to determine trends in the distribution and abundance and density of the species.

1. Method one.

In the majority of sites where rosettes carpet the ground, a polygon of the area containing *S. hirculus* should be marked out using bamboo sticks to define the edges. To improve visibility, placing red or blue tape on the top of the bamboo is highly recommended. The area is then marked out using a suitable GPS receiver (see section 4) and the density of rosette coverage within the polygon is then estimated in 1 m² relevés. Depending on the area of the colony five or less relevés are **randomly** selected in each site (see details given in the Individual Site Assessments in Appendix I). These should utilise 1 m² quadrats subdivided into 25 x 25 cm divisions to facilitate counting of rosettes. The cover of indicator species for the Habitat for the Species Assessment should also be recorded at this stage (see Section 5.2.3).

2. Method two.

The second method for the more clumped and scattered populations involves recording of individual/groups of plants as geo-referenced points. A polygon is later created to encompass all points. In addition, the five 1 m² quadrats should be placed in areas of *S. hirculus* and cover of indicator species for the Habitat for the Species Assessment recorded.

The total number of rosettes is then calculated from the product of the population area and density.

5.1.2 Number of flowering heads

Number of flowering heads is assessed visually and assigned into a category of magnitude, e.g. 10s, 100s, 1,000s, or 10,000s.

5.2 Section B: Habitat for the Species Assessment

Table 3 gives an example of a completed Habitat for the Species Assessment section. The details of how to assess each category are also outlined below. The indicators used are the area occupied by *S. hirculus*, the water depth in the location within the flush containing *S. hirculus*, the vegetation height and the intensity of grazing. In addition, floristic work on these flushes (Muldoon, 2011) has indicated the negative indicators *Molinia caerulea* and *Holcus lanatus*, and the positive indicator *Sagina nodosa*.

Table 3: Habitat Assessment indicators and targets for *Saxifraga hirculus*.

Indicator	Target	Result	Pass/Fail
Area of *Saxifraga hirculus*	> 430 m²	470 m²	Pass
Water level	Water level should cover hand when pressed into the vegetation	Water level covered hand	Pass
Cover of *Sagina nodosa* - positive indicator species	*Sagina nodosa* should be present in at least two of five recorded 1 m² relevés	Present in 2 or more relevés	Pass
Cover of *Molinia caerulea* - negative indicator species	Mean percent cover of *Molinia caerulea* recorded in five 1 m² relevés should not exceed 5%	Cover < 5%	Pass
Cover of *Holcus lanatus* - negative indicator species	Mean percent cover of *Holcus lanatus* recorded in five 1 m² relevés should not exceed 15%	Cover < 15%	Pass
Vegetation height	Mean percent vegetation height recorded in five 1 m² relevés should not exceed 15 cm	Mean height < 15 cm	Pass
Grazing	Grazing levels should not exceed 26–50% in the five 1 m² relevés	26–50%	Pass

5.2.1 Area occupied by Saxifraga hirculus

This has already been calculated from the polygons created in Section A. The baseline and previously recorded polygons should be uploaded to the GPS prior to surveying to allow comparison in the field.

5.2.2 Water level

This is a simple assessment of the wetness of the site. When the flattened hand is pressed into the vegetation the water level should cover the fingers.

5.2.3 Cover of indicator species

This will have already been calculated during the Population Assessment in Section A. The mean value across all quadrats should be calculated, including anywhere a zero value was obtained.

5.2.4 Mean vegetation height

Vegetation height should be recorded in each relevé. This is estimated by taking four measurements with a ruler at 25 cm intervals across the 1 m^2 quadrat and calculating the mean. In each case, the highest vegetation at each point is recorded.

5.2.5 Grazing

Grazing levels are assigned to four categories; 0–25%, 26–50%, 51–75% and 76–100%. Each quadrat should be assigned to a category based on visual examination of the vegetation in each quadrat and an estimation of the percentage vegetation grazed.

- 0–25% - the vegetation is rank and little or no grazing is evident
- 26–50% - this is optimal where the vegetation is under moderate levels of grazing, some small open areas may be present and an examination of the vegetation would show evidence of grazing. However, flowering should occur.
- 51–75% - the vegetation is cropped extremely short with very little or no flowering occurring, areas of bare peat more pronounced.
- 76–100% - very little vegetation present due to heavy overgrazing.

For individual flushes, the median of each category should be calculated and these averaged to reassign the grazing levels to one of the four categories above.

5.3 Section C: Future Prospects Assessment

The site assessment sheet contains sections to record pressures and threats to the species at each site. Continued and standardised assessment of the local threat status will be important in monitoring trends over time, and will ultimately help inform management decisions. The future prospects of *S. hirculus* are believed to be stable in the short/medium term. The distribution has declined historically, but those former sites were lost due to various activities such as agriculture and peat removal. As such, those habitats no longer remain and the current sites are considered to be in Favourable Conservation Status. Grazing remains a concern as high levels of flower loss has been recorded. However, the implementation of sheep destocking levels proposed by the Commonage Framework Plan through the Rural Environmental Scheme (REPS 4) and National Farm Plan Scheme should reduce the pressure from overgrazing.

These categories are assessed based on a visual examination of the flush ('inside'; see Table 4), and its surrounding habitat ('outside'; see Table 4). The intensity of the activity is graded low, medium or high. Additional activities should be recorded and included as observed. An example of a Future Prospects Assessment section is given in Table 4**Error! Reference source not found.** below.

Table 4: Example of Future Prospects Assessment for *Saxifraga hirculus.*

Activity	**Location** **Inside or outside the flush**	**Influence** **Negative/Positive/ Neutral**	**Intensity** **High/Medium/Low**	**Area affected** **m^2**
Undergrazing	**Inside**	N/A		
Overgrazing	**Inside**	N/A		
Overgrazing	**Outside**	Negative	Low	> 100 m^2
Poaching	**Inside**	Positive	Low	2 m^2
Poaching	**Outside**	N/A		
Drainage	**Inside**	N/A		
Drainage	**Outside**	Negative	Low	> 100 m^2
Vehicle damage	**Inside**	N/A		
Peat cutting	**Outside**	N/A		
Degraded peat	**Outside**	Negative	Medium	> 100 m^2

5.4 Section D: Overall Assessment

To derive an overall assessment, the Population, Habitat and Future Prospects Assessments are combined. Following the completion of all sections an overall score of Green, Amber or Red is assigned using the criteria set out below. An example of an Overall Assessment section is given in Table 5.

Table 5: Population Assessment indicators and targets for *Saxifraga hirculus.*

Attribute	**Assessment**
Population	Green
Habitat for the Species	Green
Future Prospects	Green
Overall	Green

Population assessment

For the overall Population assessment the following criteria were used:

- 2 passes = Favourable (Green),
- 1 pass = Unfavourable - Inadequate (Amber),
- 0 passes = Unfavourable - Bad (Red).

Habitat for the Species assessment

For the overall Habitat for the Species assessment the following criteria were used:

- 7 passes = Favourable (Green),
- 4 – 6 passes = Unfavourable - Inadequate (Amber),
- 0 – 4 passes = Unfavourable - Bad (Red).

Future Prospects assessment

The assessment of Future Prospects is more subjective. If there is no significant impact of the activities the Future Prospects should be assessed as Green, moderate impact should be assessed as Amber and severe impact as Red.

Overall assessment

The overall assessment of the site is carried out by combining the results from all the other assessments using the following criteria:

- All Green = Favourable (Green),
- 1 – 3 Amber = Unfavourable - Inadequate (Amber)
- 1 Red = Unfavourable - Bad (Red).

Individual polygons are provided for each flush and should be downloaded to the GPS prior to surveying. A map showing the location of each flush is given in Appendix III.

5.5 Field Assessment

All questions on the field survey sheets should be filled in on site to the best ability of the surveyor. The aim is to record the extent of the plant and any pressures or threats on an individual location basis. It is recommended that the sheet containing the previous monitoring results be used in the field and the current monitoring results added. This will enable the surveyor to ascertain if any changes have taken place between surveys. The sheet outlining the species composition found at each site should also be filled in.

5.6 Timing of surveys

Surveys should be carried out between July and September to allow estimation of grazing levels and the identification of associated flowering species.

6. Recommendations for on-going monitoring

The four populations at Sheean are considered to be in a favourable condition (see Appendix II) as are those at Uggool, Largan Mor A, Largan Mor B, Sheskin A, Sheskin B, Formoyle and Aghoo. These sites should be monitored on a five yearly basis to ensure no adverse conditions have arisen, but not more frequently than this in order to preserve the fragile habitats.

The site at Bellacorick may be in a precarious condition. *S. hirculus* coverage is extremely patchy with the number of rosettes recorded standing at 700. Immediate recommendations would be the removal of the fence surrounding it to encourage grazers such as sheep and deer. This should have the benefit of opening up the vegetation and reducing vegetation height. The blocking of the drains by Bord na Móna will hopefully cause rewetting of the site and reverse the damage caused by years of industrial peat removal. Strimming of the vegetation is another management technique that has been suggested at other *S. hirculus* sites across Europe where an increase in a Swedish *S. hirculus* population following a period of haymaking, which eliminated ligneous species and hummock forming mosses, was noted by Ohlson as cited in Vittoz *et al*. (2006). As in the past grazers have largely been excluded through fencing, it is worthwhile trying the natural, less invasive method of unrestricted grazing first. If no beneficial results are seen through natural grazing, strimming prior to the *S. hirculus* flowering season may be worth considering with particular emphasis on the negative indicators species such as *M. caerulea* and *H. lanatus.* Yearly monitoring would be recommended at this site.

The situation at Barroosky, although generally considered favourable with a large *S. hirculus* population, also raises conservation concerns, although not as immediate as Bellacorick. Ongoing dialogue with the owner of the land should continue to ensure no improvements (e.g. fertilizer inputs) are carried out on site. Monitoring the levels of *M. caerulea* on site is important here also. Monitoring on either a yearly basis or every second year would be recommended for this site.

The more intensive monitoring suggested for Barroosky and Bellacorick should be reviewed on a 5 yearly basis and a decision taken on future monitoring levels at that time.

7. Conclusion

There are many threats to the blanket bogs of Ireland and by association their flushes and rare species. These range from more immediate actions such as severe overgrazing, afforestation, peat cutting, burning, erosion and infrastructure development (Douglas, 1998) to those as yet unquantifiable such as climate change (Heijmans *et al*., 2008). It is hoped that monitoring of the rare *S. hirculus* will aid in the preservation of flushes. The species requires not only the habitat of the flushes to survive, but also the landscape mosaic within which they exist.

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Appendix I - Individual Site Assessments – 2010 results

Assessment of Sheean A

Population Assessment for Sheean A

Indicator	Target	Result	Pass/Fail
Total number of rosettes	> 150,000	189,000	Pass
Density of rosettes	The mean number of *Saxifraga hirculus* rosettes should be > 84 when recorded in five or more 1 m^2 relevés	> 84	Pass
Number of flowering heads	> 10,000	10,000s	Pass

Habitat for the Species Assessment for Sheean A

Indicator	Target	Result	Pass/Fail
Area of *Saxifraga hirculus*	> 1,620 m^2	1,800 m^2	Pass
Water level	Water level should cover hand when pressed into the vegetation	Water level covered hand	Pass
Cover of *Sagina nodosa* - positive indicator species	*Sagina nodosa* should be present in at least two of five recorded 1 m^2 relevés	Present in > 2	Pass
Cover of *Molinia caerulea* - negative indicator species	Mean percent cover of *Molinia caerulea* recorded in five 1 m^2 relevés should not exceed 5%	< 5%	Pass
Cover of *Holcus lanatus* - negative indicator species	Mean percent cover of *Holcus lanatus* recorded in five 1 m^2 relevés should not exceed 15%	< 15%	Pass
Vegetation height	Mean percent vegetation height recorded in five 1 m^2 relevés should not exceed 15 cm	13.25 cm	Pass
Grazing	Grazing levels should not exceed 26–50% in the five 1 m^2 relevés	26–50%	Pass

Future Prospects Assessment for Sheean A

Activity	Location Inside or outside the flush	Influence Negative/Positive/ Neutral	Intensity High/Medium/Low	Colour code
Undergrazing	**Inside**	Negative	Low	Green
Overgrazing	**Inside**	Negative	Low	Green
Overgrazing	**Outside**	Negative	Low	Green
Poaching	**Inside**	Negative	Low	Green
Poaching	**Outside**	Negative	Low	Green
Drainage	**Inside**	Negative	Low	Green
Drainage	**Outside**	Negative	Low	Green
Vehicle damage	**Inside**	Negative	Low	Green
Peat cutting	**Outside**	Negative	Low	Green
Degraded peat	**Outside**	Negative	Low	Green

Overall Assessment for Sheean A

Attribute	Assessment
Population	Green
Habitat for the Species	Green
Future Prospects	Green
Overall	Green

Assessment of Sheean B

Population Assessment for Sheean B

Indicator	Target	Result	Pass/Fail
Total number of rosettes	> 36,000	45,000	Pass
Density of rosettes	The mean number of *Saxifraga hirculus* rosettes should be > 70 when recorded in five or more 1 m^2 relevés	> 70	Pass
Number of flowering heads	10,000s	10,000s	Pass

Habitat for the Species Assessment for Sheean B

Indicator	Target	Result	Pass/Fail
Area of *Saxifraga hirculus*	> 430 m^2	470 m^2	Pass
Water level	Water level should cover hand when pressed into the vegetation	Water level covered hand	Pass
Cover of *Sagina nodosa* - positive indicator species	*Sagina nodosa* should be present in at least two of five recorded 1 m^2 relevés	Present in 2 or more	Pass
Cover of *Molinia caerulea* - negative indicator species	Mean percent cover of *Molinia caerulea* recorded in five 1 m^2 relevés should not exceed 5%	< 5%	Pass
Cover of *Holcus lanatus* - negative indicator species	Mean percent cover of *Holcus lanatus* recorded in five 1 m^2 relevés should not exceed 15%	< 15%	Pass
Vegetation height	Mean percent vegetation height recorded in five 1 m^2 relevés should not exceed 15 cm	< 15 cm	Pass
Grazing	Grazing levels should not exceed 26–50% in the five 1 m^2 relevés	26–50%	Pass

Future Prospects Assessment for Sheean B

Activity	Location Inside or outside the flush	Influence Negative/Positive/ Neutral	Intensity High/Medium/Low	Colour code
Undergrazing	**Inside**	Negative	Low	Green
Overgrazing	**Inside**	Negative	Low	Green
Overgrazing	**Outside**	Negative	Low	Green
Poaching	**Inside**	Negative	Low	Green
Poaching	**Outside**	Negative	Low	Green
Drainage	**Inside**	Negative	Low	Green
Drainage	**Outside**	Negative	Low	Green
Vehicle damage	**Inside**	Negative	Low	Green
Peat cutting	**Outside**	Negative	Low	Green
Degraded peat	**Outside**	Negative	Low	Green

Overall Assessment for Sheean B

Attribute	Assessment
Population	Green
Habitat for the Species	Green
Future Prospects	Green
Overall	Green

Assessment of Sheean C

Population Assessment for Sheean C

Indicator	Target	Result	Pass/Fail
Total number of rosettes	> 104,000	130,000	Pass
Density of rosettes	The mean number of *Saxifraga hirculus* rosettes should be > 120 when recorded in five or more 1 m^2 relevés	> 120	Pass
Number of flowering heads	10,000s	10,000s	Pass

Habitat for the Species Assessment for Sheean C

Indicator	Target	Result	Pass/Fail
Area of *Saxifraga hirculus*	> 790 m^2	870 m^2	Pass
Water level	Water level should cover hand when pressed into the vegetation	Water level covered hand	Pass
Cover of *Sagina nodosa* - positive indicator species	*Sagina nodosa* should be present in at least two of five recorded 1 m^2 relevés	Present in > 2	Pass
Cover of *Molinia caerulea* - negative indicator species	Mean percent cover of *Molinia caerulea* recorded in five 1 m^2 relevés should not exceed 5%	< 5%	Pass
Cover of *Holcus lanatus* - negative indicator species	Mean percent cover of *Holcus lanatus* recorded in five 1 m^2 relevés should not exceed 15%	< 10%	Pass
Vegetation height	Mean percent vegetation height recorded in five 1 m^2 relevés should not exceed 15 cm	< 15 cm	Pass
Grazing	Grazing levels should not exceed 26–50% in the five 1 m^2 relevés	26–50%	Pass

Future Prospects Assessment for Sheean C

Activity	Location Inside or outside the flush	Influence Negative/Positive/ Neutral	Intensity High/Medium/Low	Colour code
Undergrazing	**Inside**	Negative	Low	Green
Overgrazing	**Inside**	Negative	Low	Green
Overgrazing	**Outside**	Negative	Low	Green
Poaching	**Inside**	Negative	Low	Green
Poaching	**Outside**	Negative	Low	Green
Drainage	**Inside**	Negative	Low	Green
Drainage	**Outside**	Negative	Low	Green
Vehicle damage	**Inside**	Negative	Low	Green
Peat cutting	**Outside**	Negative	Low	Green
Degraded peat	**Outside**	Negative	Low	Green

Overall Assessment for Sheean C

Attribute	Assessment
Population	Green
Habitat for the Species	Green
Future Prospects	Green
Overall	Green

Assessment of Sheean D

Population Assessment for Sheean D

Indicator	Target	Result	Pass/Fail
Total number of rosettes	> 19,000	24,000	Pass
Density of rosettes	The mean number of *Saxifraga hirculus* rosettes should be > 33 when recorded in five or more 1 m^2 relevés	> 33	Pass
Number of flowering heads	1,000s	1,000s	Pass

Habitat for the Species Assessment for Sheean D

Indicator	Target	Result	Pass/Fail
Area of *Saxifraga hirculus*	> 510 m^2	570 m^2	Pass
Water level	Water level should cover hand when pressed into the vegetation	Water level covered hand	Pass
Cover of *Sagina nodosa* - positive indicator species	*Sagina nodosa* should be present in at least two of five recorded 1 m^2 relevés	> 2	Pass
Cover of *Molinia caerulea* - negative indicator species	Mean percent cover of *Molinia caerulea* recorded in five 1 m^2 relevés should not exceed 5%	< 5%	Pass
Cover of *Holcus lanatus* - negative indicator species	Mean percent cover of *Holcus lanatus* recorded in five 1 m^2 relevés should not exceed 15%	< 15%	Pass
Vegetation height	Mean percent vegetation height recorded in five 1 m^2 relevés should not exceed 15 cm	< 15 cm	Pass
Grazing	Grazing levels should not exceed 26–50% in the five 1 m^2 relevés	26–50%	Pass

Future Prospects Assessment for Sheean D

Activity	Location Inside or outside the flush	Influence Negative/Positive/ Neutral	Intensity High/Medium/Low	Colour code
Undergrazing	**Inside**	Negative	Low	Green
Overgrazing	**Inside**	Negative	Low	Green
Overgrazing	**Outside**	Negative	Low	Green
Poaching	**Inside**	Negative	Low	Green
Poaching	**Outside**	Negative	Low	Green
Drainage	**Inside**	Negative	Low	Green
Drainage	**Outside**	Negative	Low	Green
Vehicle damage	**Inside**	Negative	Low	Green
Peat cutting	**Outside**	Negative	Low	Green
Degraded peat	**Outside**	Negative	Low	Green

Overall Assessment for Sheean D

Attribute	Assessment
Population	Green
Habitat for the Species	Green
Future Prospects	Green
Overall	Green

Assessment of Bellacorick

Population Assessment for Bellacorick

Indicator	Target	Result	Pass/Fail
Total number of rosettes	> 560	700	Pass
Number of flowering heads	100s	100s	Pass

Habitat for the Species Assessment for Bellacorick

Indicator	Target	Result	Pass/Fail
Area of *Saxifraga hirculus*	> 855 m^2	950 m^2	Pass
Water level	Water level should cover hand when pressed into the vegetation	Water level covered hand	Pass
Cover of *Sagina nodosa* - positive indicator species	*Sagina nodosa* should be present in at least two of five recorded 1 m^2 relevés	Not present	Fail
Cover of *Molinia caerulea* - negative indicator species	Mean percent cover of *Molinia caerulea* recorded in five 1 m^2 relevés should not exceed 5%	> 5%	Fail
Cover of *Holcus lanatus* - negative indicator species	Mean percent cover of *Holcus lanatus* recorded in five 1 m^2 relevés should not exceed 15%	< 15%	Pass
Vegetation height	Mean percent vegetation height recorded in five 1 m^2 relevés should not exceed 15 cm	> 15 cm	Fail
Grazing	Grazing levels should not exceed 26–50% in the five 1 m^2 relevés	0–25%	Fail

Future Prospects Assessment for Bellacorick

Activity	Location Inside or outside the flush	Influence Negative/Positive/ Neutral	Intensity High/Medium/Low	Colour code
Undergrazing	**Inside**	Negative	High	Red
Overgrazing	**Inside**	Negative	Low	Green
Overgrazing	**Outside**	Negative	Low	Green
Poaching	**Inside**	Negative	Low	Green
Poaching	**Outside**	Negative	Low	Green
Drainage	**Inside**	Negative	High	Red
Drainage	**Outside**	Negative	High	Red
Vehicle damage	**Inside**	Negative	Low	Green
Peat cutting	**Outside**	Negative	High	Red
Degraded peat	**Outside**	Negative	High	Red

Overall Assessment for Bellacorick

Attribute	Assessment
Population	Green
Habitat for the Species	Red
Future Prospects	Red
Overall	Red

Assessment of Barroosky

Population Assessment for Barroosky

Indicator	Target	Result	Pass/Fail
Total number of rosettes	> 52,000	65,000	Pass
Density of rosettes	The mean number of *Saxifraga hirculus* rosettes should be > 24 when recorded in five or more 1 m^2 relevés	> 24	Pass
Number of flowering heads	10,000s	10,000s	Pass

Habitat for the Species Assessment for Barroosky

Indicator	Target	Result	Pass/Fail
Area of *Saxifraga hirculus*	> 2,025 m^2	2,250 m^2	Pass
Water level	Water level should cover hand when pressed into the vegetation	Water level covered hand	Pass
Cover of *Sagina nodosa* - positive indicator species	*Sagina nodosa* should be present in at least two of five recorded 1 m^2 relevés	Not present	Fail
Cover of *Molinia caerulea* - negative indicator species	Mean percent cover of *Molinia caerulea* recorded in five 1 m^2 relevés should not exceed 5%	< 5%	Pass
Cover of *Holcus lanatus* - negative indicator species	Mean percent cover of *Holcus lanatus* recorded in five 1 m^2 relevés should not exceed 15%	< 15%	Pass
Vegetation height	Mean percent vegetation height recorded in five 1 m^2 relevés should not exceed 15 cm	< 15 cm	Pass
Grazing	Grazing levels should not exceed 26–50% in the five 1 m^2 relevés	26–50%	Pass

Future Prospects Assessment for Barroosky

Activity	Location Inside or outside the flush	Influence Negative/Positive/ Neutral	Intensity High/Medium/Low	Colour code
Undergrazing	**Inside**	Negative	Low	Green
Overgrazing	**Inside**	Negative	Low	Green
Overgrazing	**Outside**	Negative	High	Red
Poaching	**Inside**	Negative	Low	Green
Poaching	**Outside**	Negative	High	Red
Drainage	**Inside**	Negative	Low	Green
Drainage	**Outside**	Negative	Low	Green
Vehicle damage	**Inside**	Negative	Medium	Amber
Peat cutting	**Outside**	Negative	Low	Green
Degraded peat	**Outside**	Negative	High	Red

Overall Assessment for Barroosky

Attribute	Assessment
Population	Green
Habitat for the Species	Green
Future Prospects	Amber
Overall	Amber

Assessment of Uggool

Population Assessment for Uggool

Indicator	Target	Result	Pass/Fail
Total number of rosettes	> 24,000	30,000	Pass
Density of rosettes	The mean number of *Saxifraga hirculus* rosettes should be > 84 when recorded in five or more 1 m^2 relevés	> 84	Pass
Number of flowering heads	1,000s	1,000s	Pass

Habitat for the Species Assessment for Uggool

Indicator	Target	Result	Pass/Fail
Area of *Saxifraga hirculus*	> 283 m^2	315 m^2	Pass
Water level	Water level should cover hand when pressed into the vegetation	Water level covered hand	Pass
Cover of *Sagina nodosa* - positive indicator species	*Sagina nodosa* should be present in at least two of five recorded 1 m^2 relevés	Present	Pass
Cover of *Molinia caerulea* - negative indicator species	Mean percent cover of *Molinia caerulea* recorded in five 1 m^2 relevés should not exceed 5%	< 5%	Pass
Cover of *Holcus lanatus* - negative indicator species	Mean percent cover of *Holcus lanatus* recorded in five 1 m^2 relevés should not exceed 15%	> 15%	Fail
Vegetation height	Mean percent vegetation height recorded in five 1 m^2 relevés should not exceed 15 cm	< 15 cm	Pass
Grazing	Grazing levels should not exceed 26–50% in the five 1 m^2 relevés	26–50%	Pass

Future Prospects Assessment for Uggool

Activity	Location Inside or outside the flush	Influence Negative/Positive/ Neutral	Intensity High/Medium/Low	Colour code
Undergrazing	**Inside**	Negative	Low	Green
Overgrazing	**Inside**	Negative	Low	Green
Overgrazing	**Outside**	Negative	Low	Green
Poaching	**Inside**	Negative	Low	Green
Poaching	**Outside**	Negative	Low	Green
Drainage	**Inside**	Negative	Low	Green
Drainage	**Outside**	Negative	Low	Green
Vehicle damage	**Inside**	Negative	Low	Green
Peat cutting	**Outside**	Negative	Low	Green
Degraded peat	**Outside**	Negative	Low	Green

Overall Assessment for Uggool

Attribute	Assessment
Population	Green
Habitat for the Species	Green
Future Prospects	Green
Overall	Green

Assessment of Largan Mor A

Population Assessment for Largan Mor A

Indicator	Target	Result	Pass/Fail
Total number of rosettes	> 2,800	3,500	Pass
Density of rosettes	The mean number of *Saxifraga hirculus* rosettes should be > 30 when recorded in five or more 1 m^2 relevés	> 30	Pass
Number of flowering heads	1,000s	1,000s	Pass

Habitat for the Species Assessment for Largan Mor A

Indicator	Target	Result	Pass/Fail
Area of *Saxifraga hirculus*	> 83 m^2	93 m^2	Pass
Water level	Water level should cover hand when pressed into the vegetation	Water level covered hand	Pass
Cover of *Sagina nodosa* - positive indicator species	*Sagina nodosa* should be present in at least two of five recorded 1 m^2 relevés	Not present	Fail
Cover of *Molinia caerulea* - negative indicator species	Mean percent cover of *Molinia caerulea* recorded in five 1 m^2 relevés should not exceed 5%	< 5%	Pass
Cover of *Holcus lanatus* - negative indicator species	Mean percent cover of *Holcus lanatus* recorded in five 1 m^2 relevés should not exceed 15%	< 15%	Pass
Vegetation height	Mean percent vegetation height recorded in five 1 m^2 relevés should not exceed 15 cm	< 15 cm	Pass
Grazing	Grazing levels should not exceed 26–50% in the five 1 m^2 relevés	0–25%	Fail

Future Prospects Assessment for Largan Mor A

Activity	Location Inside or outside the flush	Influence Negative/Positive/ Neutral	Intensity High/Medium/Low	Colour code
Undergrazing	**Inside**	Negative	Low	Green
Overgrazing	**Inside**	Negative	Low	Green
Overgrazing	**Outside**	Negative	Low	Green
Poaching	**Inside**	Negative	Low	Green
Poaching	**Outside**	Negative	Low	Green
Drainage	**Inside**	Negative	Low	Green
Drainage	**Outside**	Negative	Low	Green
Vehicle damage	**Inside**	Negative	Low	Green
Peat cutting	**Outside**	Negative	Low	Green
Degraded peat	**Outside**	Negative	Low	Green

Overall Assessment for Largan Mor A

Attribute	Assessment
Population	Green
Habitat for the Species	Amber
Future Prospects	Green
Overall	Green

Assessment of Largan Mor B

Population Assessment for Largan Mor B

Indicator	Target	Result	Pass/Fail
Total number of rosettes	> 440	550	Pass
Density of rosettes	The mean number of *Saxifraga hirculus* rosettes should be > 88 when recorded in five or more 1 m^2 relevés	> 88	Pass

Habitat for the Species Assessment for Largan Mor B

Indicator	Target	Result	Pass/Fail
Area of *Saxifraga hirculus*	> 4.5 m^2	5 m^2	Pass
Water level	Water level should cover hand when pressed into the vegetation	Water level covered hand	Pass
Cover of *Sagina nodosa* - positive indicator species	*Sagina nodosa* should be present in at least two of five recorded 1 m^2 relevés	Not present	Fail
Cover of *Molinia caerulea* - negative indicator species	Mean percent cover of *Molinia caerulea* recorded in five 1 m^2 relevés should not exceed 5%	< 5%	Pass
Cover of *Holcus lanatus* - negative indicator species	Mean percent cover of *Holcus lanatus* recorded in five 1 m^2 relevés should not exceed 15%	< 15%	Pass
Vegetation height	Mean percent vegetation height recorded in five 1 m^2 relevés should not exceed 15 cm	< 15 cm	Pass
Grazing	Grazing levels should not exceed 26–50% in two 1 m^2 relevés	0–25%	Fail

Future Prospects Assessment for Largan Mor B

Activity	Location Inside or outside the flush	Influence Negative/Positive/ Neutral	Intensity High/Medium/Low	Colour code
Undergrazing	**Inside**	Negative	Low	Green
Overgrazing	**Inside**	Negative	Low	Green
Overgrazing	**Outside**	Negative	Low	Green
Poaching	**Inside**	Negative	Low	Green
Poaching	**Outside**	Negative	Low	Green
Drainage	**Inside**	Negative	Low	Green
Drainage	**Outside**	Negative	Low	Green
Vehicle damage	**Inside**	Negative	Low	Green
Peat cutting	**Outside**	Negative	Low	Green
Degraded peat	**Outside**	Negative	Low	Green

Overall Assessment for Largan Mor B

Attribute	Assessment
Population	Green
Habitat for the Species	Amber
Future Prospects	Green
Overall	Green

Assessment of Sheskin A

Population Assessment for Sheskin A

Indicator	Target	Result	Pass/Fail
Total number of rosettes	> 288	360	Pass
Density of rosettes	The mean number of *Saxifraga hirculus* rosettes should be > 18 when recorded in five or more 1 m^2 relevés	> 18	Pass
Number of flowering heads	100s	100s	Pass

Habitat for the Species Assessment for Sheskin A

Indicator	Target	Result	Pass/Fail
Area of *Saxifraga hirculus*	> 14 m^2	16 m^2	Pass
Water level	Water level should cover hand when pressed into the vegetation	Water level covered hand	Pass
Cover of *Sagina nodosa* - positive indicator species	*Sagina nodosa* should be present in at least two of five recorded 1 m^2 relevés	Not present	Fail
Cover of *Molinia caerulea* - negative indicator species	Mean percent cover of *Molinia caerulea* recorded in five 1 m^2 relevés should not exceed 5%	< 5%	Pass
Cover of *Holcus lanatus* - negative indicator species	Mean percent cover of *Holcus lanatus* recorded in five 1 m^2 relevés should not exceed 15%	< 15%	Pass
Vegetation height	Mean percent vegetation height recorded in five 1 m^2 relevés should not exceed 15 cm	> 15 cm	Fail
Grazing	Grazing levels should not exceed 26–50% in the five 1 m^2 relevés	0–25%	Fail

Future Prospects Assessment for Sheskin A

Activity	Location Inside or outside the flush	Influence Negative/Positive/ Neutral	Intensity High/Medium/Low	Colour code
Undergrazing	**Inside**	Negative	Low	Green
Overgrazing	**Inside**	Negative	Low	Green
Overgrazing	**Outside**	Negative	Low	Green
Poaching	**Inside**	Negative	Low	Green
Poaching	**Outside**	Negative	Low	Green
Drainage	**Inside**	Negative	Low	Green
Drainage	**Outside**	Negative	Low	Green
Vehicle damage	**Inside**	Negative	Low	Green
Peat cutting	**Outside**	Negative	Low	Green
Degraded peat	**Outside**	Negative	Low	Green

Overall Assessment for Sheskin A

Attribute	Assessment
Population	Green
Habitat for the Species	Amber
Future Prospects	Green
Overall	Green

Assessment of Sheskin B

Population Assessment for Sheskin B

Indicator	Target	Result	Pass/Fail
Total number of rosettes	> 92	116	Pass
Number of flowering heads	10s	10s	Pass

Habitat for the Species Assessment for Sheskin B

Indicator	Target	Result	Pass/Fail
Area of *Saxifraga hirculus*	> 14 m^2	280 m^2	Pass
Water level	Water level should cover hand when pressed into the vegetation	Water level covered hand	Pass
Cover of *Sagina nodosa* - positive indicator species	*Sagina nodosa* should be present in at least two of five recorded 1 m^2 relevés	Not present	Fail
Cover of *Molinia caerulea* - negative indicator species	Mean percent cover of *Molinia caerulea* recorded in five 1 m^2 relevés should not exceed 5%	< 5%	Pass
Cover of *Holcus lanatus* - negative indicator species	Mean percent cover of *Holcus lanatus* recorded in five 1 m^2 relevés should not exceed 15%	< 15%	Pass
Vegetation height	Mean percent vegetation height recorded in five 1 m^2 relevés should not exceed 15 cm	> 15 cm	Fail
Grazing	Grazing levels should not exceed 26–50% in the five 1 m^2 relevés	0–25%	Fail

Future Prospects Assessment for Sheskin B

Activity	Location Inside or outside the flush	Influence Negative/Positive/ Neutral	Intensity High/Medium/Low	Colour code
Undergrazing	**Inside**	Negative	Low	Green
Overgrazing	**Inside**	Negative	Low	Green
Overgrazing	**Outside**	Negative	Low	Green
Poaching	**Inside**	Negative	Low	Green
Poaching	**Outside**	Negative	Low	Green
Drainage	**Inside**	Negative	Low	Green
Drainage	**Outside**	Negative	Low	Green
Vehicle damage	**Inside**	Negative	Low	Green
Peat cutting	**Outside**	Negative	Low	Green
Degraded peat	**Outside**	Negative	Low	Green

Overall Assessment for Sheskin B

Attribute	Assessment
Population	Green
Habitat for the Species	Amber
Future Prospects	Green
Overall	Green

Assessment of Formoyle

Population Assessment for Formoyle

Indicator	Target	Result	Pass/Fail
Total number of rosettes	> 136	170	Pass
Density of rosettes	The mean number of *Saxifraga hirculus* rosettes should be > 2 when recorded in five or more 1 m^2 relevés	> 2	Pass
Number of flowering heads	10s	10s	Pass

Habitat for the Species Assessment for Formoyle

Indicator	Target	Result	Pass/Fail
Area of *Saxifraga hirculus*	> 65 m^2	73 m^2	Pass
Water level	Water level should cover hand when pressed into the vegetation	Water level covered hand	Pass
Cover of *Sagina nodosa* - positive indicator species	*Sagina nodosa* should be present in at least two of five recorded 1 m^2 relevés	Not present	Fail
Cover of *Molinia caerulea* - negative indicator species	Mean percent cover of *Molinia caerulea* recorded in five 1 m^2 relevés should not exceed 5%	< 5%	Pass
Cover of *Holcus lanatus* - negative indicator species	Mean percent cover of *Holcus lanatus* recorded in five 1 m^2 relevés should not exceed 15%	< 15%	Pass
Vegetation height	Mean percent vegetation height recorded in five 1 m^2 relevés should not exceed 15 cm	< 15 cm	Pass
Grazing	Grazing levels should not exceed 26–50% in the five 1 m^2 relevés	0–25%	Fail

Future Prospects Assessment for Formoyle

Activity	Location Inside or outside the flush	Influence Negative/Positive/ Neutral	Intensity High/Medium/Low	Colour code
Undergrazing	**Inside**	Negative	Low	Green
Overgrazing	**Inside**	Negative	Low	Green
Overgrazing	**Outside**	Negative	Low	Green
Poaching	**Inside**	Negative	Low	Green
Poaching	**Outside**	Negative	Low	Green
Drainage	**Inside**	Negative	Low	Green
Drainage	**Outside**	Negative	Low	Green
Vehicle damage	**Inside**	Negative	Low	Green
Peat cutting	**Outside**	Negative	Low	Green
Degraded peat	**Outside**	Negative	Low	Green

Overall Assessment for Formoyle

Attribute	Assessment
Population	Green
Habitat for the Species	Amber
Future Prospects	Green
Overall	Green

Assessment of Aghoo

Population Assessment for Aghoo

Indicator	Target	Result	Pass/Fail
Total number of rosettes	> 960	1,200	Pass
Density of rosettes	The mean number of *Saxifraga hirculus* rosettes should be > 5 when recorded in five or more 1 m^2 relevés	> 5	Pass
Number of flowering heads	100s	100s	Pass

Habitat for the Species Assessment for Aghoo

Indicator	Target	Result	Pass/Fail
Area of *Saxifraga hirculus*	> 170 m^2	189 m^2	Pass
Water level	Water level should cover hand when pressed into the vegetation	Water level covered hand	Pass
Cover of *Sagina nodosa* - positive indicator species	*Sagina nodosa* should be present in at least two of five recorded 1 m^2 relevés	Not present	Fail
Cover of *Molinia caerulea* - negative indicator species	Mean percent cover of *Molinia caerulea* recorded in five 1 m^2 relevés should not exceed 5%	< 5%	Pass
Cover of *Holcus lanatus* - negative indicator species	Mean percent cover of *Holcus lanatus* recorded in five 1 m^2 relevés should not exceed 15%	< 15%	Pass
Vegetation height	Mean percent vegetation height recorded in five 1 m^2 relevés should not exceed 15 cm	< 15 cm	Pass
Grazing	Grazing levels should not exceed 26–50% in the five 1 m^2 relevés	0–25%	Fail

Future Prospects Assessment for Aghoo

Activity	Location Inside or outside the flush	Influence Negative/Positive/ Neutral	Intensity High/Medium/Low	Colour code
Undergrazing	**Inside**	Negative	Low	Green
Overgrazing	**Inside**	Negative	Low	Green
Overgrazing	**Outside**	Negative	Low	Green
Poaching	**Inside**	Negative	Low	Green
Poaching	**Outside**	Negative	Low	Green
Drainage	**Inside**	Negative	Low	Green
Drainage	**Outside**	Negative	Low	Green
Vehicle damage	**Inside**	Negative	Low	Green
Peat cutting	**Outside**	Negative	Low	Green
Degraded peat	**Outside**	Negative	Low	Green

Overall Assessment for Aghoo

Attribute	Assessment
Population	Green
Habitat for the Species	Amber
Future Prospects	Green
Overall	Green

Appendix II - Overall assessment for all sites

Flush	Population	Habitat for the Species	Future Prospects	Overall	Comments
Sheean A	Green	Green	Green	Green	Currently no direct issues
Sheean B	Green	Green	Green	Green	Currently no direct issues
Sheean C	Green	Green	Green	Green	Currently no direct issues
Sheean D	Green	Green	Green	Green	Currently no direct issues
Bellacorick	Green	Red	Red	Red	Issues with former land use - industrial peat removal impacting on hydrology Issues with current grazing levels – too low Issues with vegetation height and negative indicator species
Barroosky	Green	Amber	Green	Green	Issues with the condition of the surrounding bog Issues with past vehicle damage
Uggool	Green	Green	Green	Green	Currently no direct issues
Largan Mor A	Green	Amber	Green	Green	Low grazing was identified as an issue, but vegetation height is within range
Largan Mor B	Green	Amber	Green	Green	Low grazing was identified as an issue, but vegetation height is within range
Sheskin A	Green	Amber	Green	Green	Low grazing was identified as an issue, as was vegetation height
Sheskin B	Green	Amber	Green	Green	Low grazing was identified as an issue, as was vegetation height
Formoyle	Green	Amber	Green	Green	Vegetation height was identified as an issue
Aghoo	Green	Amber	Green	Green	Low grazing was identified as an issue

Appendix III - Site location maps

Aerial photograph of the *Saxifraga hirculus* population at Aghoo

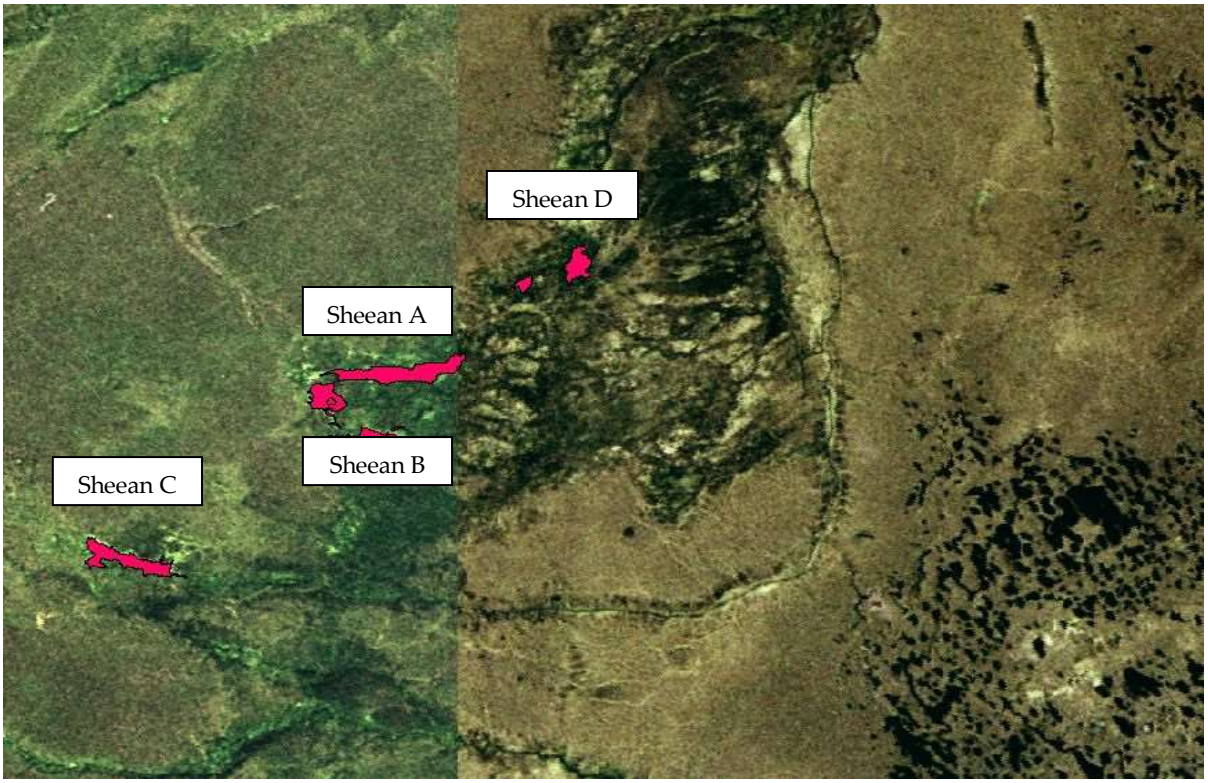
Aerial photograph of the *Saxifraga hirculus* population at Barroosky (note the small population south of the larger areas)

Aerial photograph of the *Saxifraga hirculus* population at Bellacorick

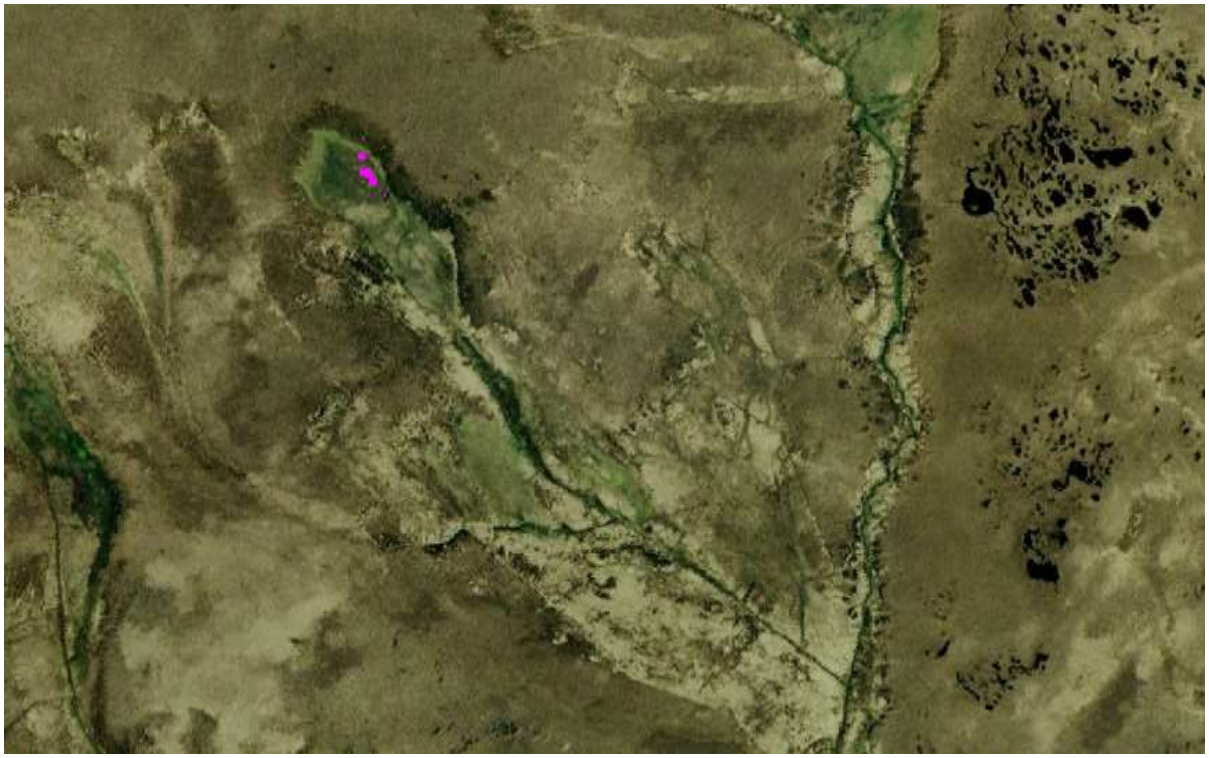
Aerial photograph of the *Saxifraga hirculus* population at Formoyle

Aerial photograph of the *Saxifraga hirculus* population at Largan Mor A

Aerial photograph of the *Saxifraga hirculus* population at Largan Mor B

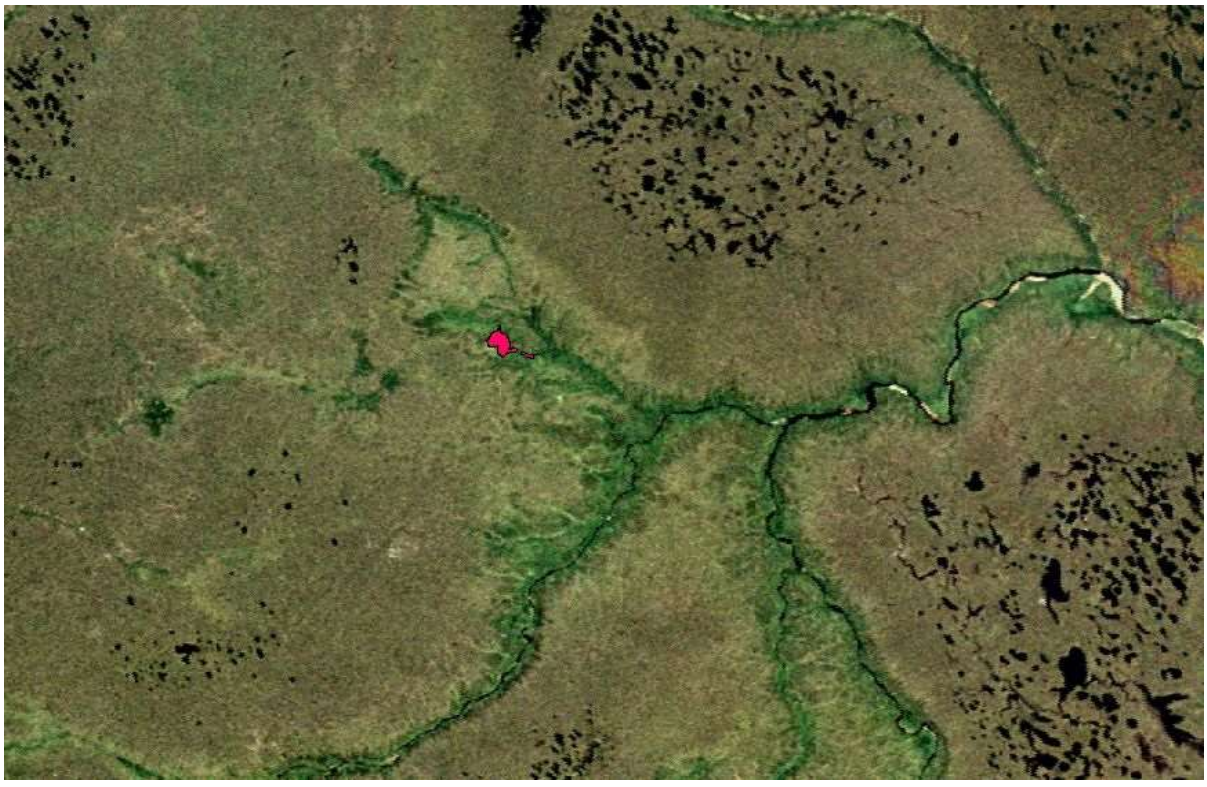


Aerial photograph of the *Saxifraga hirculus* populations at Sheean A, B, C and D



Aerial photograph of the *Saxifraga hirculus* population at Sheskin B

Aerial photograph of the *Saxifraga hirculus* population at Sheskin A



Aerial photograph of the *Saxifraga hirculus* population at Uggool