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7.2.9 Ecosystem functions restoration resulting from the project actions II -

Assessing impact of the project actions on the conservation status of the priority habitats



# December 2018

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# Introduction

The achievement of favourable conservation status for priority habitats is of central importance in the context of the EU Habitats Directive. This report evaluates how the concrete action of controlling the target bracken and scrub species impacted on the conservation status of the priority habitats: Limestone pavement (8240\*), Orchid rich calcareous grassland (6210\*), mosaic of Limestone pavement (8240\*)/Orchid rich calcareous grassland (6210\*) and Machair (21AO\*).

Most of the project area is within Orchid-rich calcareous grassland and Orchid-rich grassland/Limestone pavement mosaic and so most of the monitoring work focuses on the orchid-rich calcareous grassland vegetation. For orchid-rich grassland a comparison is made of the conservation assessment in terms of (a)presence of positive indicator species, (b) the grassland community that the vegetation aligns with and (c) the grazing score of the field, which is described in detail in the report ‘Ecosystems functions restoration resulting from the project actions I – Optimal grazing score’.

The impact of cutting trials of bracken on machair is discussed here, however, further discussion on Machair habitats of the islands may be found in the report ‘Nutrient Management of Machair.

A brief assessment of limestone pavement habitats is also provided.

## Priority Habitats

### 6210 Orchid-rich calcareous grassland

Calcareous grassland habitat comprises species-rich plant communities found on shallow well-drained calcareous substrates often in association with limestone pavement and out cropping limestone rock. The habitat comprises a mixture of grasses and herbs, with calcicole species typically frequent (Fig. 1). It is maintained by low intensity grazing (NPWS 2013).

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Fig. 1. Typical orchid-rich calcareous grassland of the islands is characterised by a high diversity of species and a high frequency of orchids

#### Priority habitat and IVC classification

The priority habitat 6210 Orchid rich grassland aligns with the IVC community GL3A*. Briza media-Thymus polytrichus* which is within the GL3 group *Cynosurus cristatus-Plantago lanceolata*. which represents dry calcareous and neutral grasslands (Table 1).

Table 1. Communities within the Dry calcareous and neutral grassland (O’Neill *et al.* 2013)

|  |  |
| --- | --- |
| 1. *Cynosurus cristatus-Plantago lanceolata* | Ellenberg fertility |
| 3a. *Briza media-Thymus polytrichus* | 2.6 |
| 3b. *Cynosurus cristatus-Trifolium repens* | 4.7 |
| 3c. *Festuca rubra-Plantago lanceolata* | 4.8 |
| 3d*. Cynosurus- Trifolium pratense* | 4.1 |
| 3e. *Festuca rubra-Rhinanthus minor* | 4.2 |
| 3f. *Festuca rubra-Lotus corniculatus* | 4.3 |

**GL 3A Briza media-Thymus polytrichus**

This community consist of swards of calcareous grassland on shallow, well drained mineral soils of poor fertility that are usually managed as low-intensity pasture. It is typically a very species-rich assemblage and has a large number of constants. This is the typical grassland to be found in association with limestone pavement (O’Neill *et al.* 2013)

### 8240 Limestone pavement

Limestone pavement consists of blocks of rock known as clints, separated by fissures or grykes. Some areas consist of massive blocks of smooth relatively un-weathered pavement with well-developed grykes, other areas consist of shattered, rubble strewn pavement. The rock surface is almost devoid of overlying soils although patches of shallow skeletal soils and occasional areas of deeper soil can occur. Limestone pavement can occur in association with calcareous grassland, heath, woodland and scrub (Wilson and Fernández 2013).

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Fig.2. Examples of limestone pavement habitats on the islands.

### 21A0 Machair

Machair are dynamic systems which are considered natural landforms that are the product of both wind erosion and cultural activities. They are globally restricted to the northwest coasts of Ireland and Scotland. There is no suit of species unique to machair and physical characteristics are important in its definition. A machair should be a flat, sandy, coastal plain, in an oceanic location with a cool moist climate (Fig. 3). The sandy substrate should have a significant percentage of shell-derived material, producing lime-rich soil with a pH normally greater than 7. The vegetation should be herb-rich, with a low frequency of sand-binding species. Wetness of the soil varies, due to the proximity of the water table, with much of the vegetation transitional between wet and dry communities. There should be a history of human interference, principally from grazing (NPWS 2013). Machair vegetation is described in more detail in the report ‘Nutrient management of machair’. Machair habitat is qualifying interest of Inis Mór (Inishmore Island SAC) 213 and and Inis Meain (Inismaan Island SAC 212) SACs.

|  |  |
| --- | --- |
|  |  |

Fig. 3. Machair sites on Inis Mór

## Target species for project actions

Scrub and bracken encroachment has been highlighted by Aran farmers as a major challenge when farming the species-rich grasslands on the islands. The particularly problematic species are Pteridium aquilinum (Bracken), *Rubus fruticosus* (briars), *Prunus spinosa* (blackthorn) with *Corylus avellana* (hazel) only an issue on parts of Inis Mór and occasionally on Inis Meáin.

### Bracken

Bracken is a large fern with an extensive rhizome system, which can store large amounts of nutrients and carbohydrates. Once the frond has unfurled, it starts to send back reserves to the rhizome (Fig. 4). In autumn, these fronds die back and all of the nutrients are re-absorbed back in to the underground storage system; therefore, cutting bracken during the winter has no effect as it is just removing dead material. Similarly, bracken in the Winterage areas of the islands, which are grazed during the winter, is not impacted by trampling of grazing livestock during the summer months when bracken is in full growth. If control is neglected, bracken’s underground storage system allows it to recover after initial treatment, therefore appropriate follow up treatment and aftercare must be planned and implemented. Bracken is frost-sensitive so it is ideally suited to the islands which are predominantly frost free.



Fig. 4. Bracken.

Bracken generally forms dense stands on deeper soils and on the walled Machair of Inis Meáin and Inis Mór (Fig. 5). Less dense stands also occur in the Winterages, in the shelter of walls and in combination with scrub species.

|  |  |
| --- | --- |
| **Bracken in Machair on Inis Meáin** | **Bracken parts of field with deeper soils on Inis Mór** |

Fig. 5. Typical examples of bracken encroachment on the islands.

Bracken can reproduce by producing spores which germinate and eventually develop in to the fern and it can reproduce vegetatively by spreading from the dense network of underground rhizomes. Vegetative spread is the most common form of bracken spread (Rasmussen *et al*. 2013).

Dense bracken growth overshadows the grassland vegetation preventing light from reaching the grassland plants causing them to die back and reduce in cover. Brackencan interfere with the germination, establishment and growth of other species through shading and smothering. The dense underground rhizome drains nutrients from the soil, and inhibits other species (Marrs and Watt 2003). Land covered in dense bracken may not be eligible for EU funded agricultural schemes, (e.g. Basic Payment Scheme).

Secondary metabolites from bracken are suspected of causing cancer in humans and harmful to livestock if eaten. The main carcinogen is e highly water-soluble norsesquiterpene glucoside ptaquiloside and can be harmful to humans and livestock if eaten. Livestock tend to only eat bracken if it is mixed in hay or if there is no other forage available. The spores of bracken also contain the carcinogen although infrequency of sporulation coupled with the low content of ptaquiloside in bracken spores means that exposure of ptaquiloside through airborne bracken spores is considered insignificant (Rasmussen *et al.* (2013). Bracken also harbours ticks which are vectors for Lyme disease in humans and Redwater in livestock.

The nature of farming on the islands - small farm sizes, fragmented farms that are labour intensive to manage and offer low financial return - has left many parts of the land unfarmed, allowing encroachment of bracken and scrub. Additionally, in the past bracken was cut and used as bedding for animals, and also to line storage pits for potatoes. As these practices died out, so did the cutting and controlling of bracken.

### Scrub

#### Target Scrub species

|  |  |
| --- | --- |
|  | ***Rubus fruticosus* (Briars)**  Briars can produce shoots from cut stems and root fragments. Stem tips can take root when they meet suitable ground, so briars can quickly spread and fill an area. After a first winter cut, long new shoots develop. Sheep and goats may eat briars in the first year of growth if other grazing is less available; however no animal will eat two/three year old woody stems (Day *et al*. 2003). |
|  | ***Prunus spinosa* (Blackthorn)**  Blackthorn is a member of the Cherry family. The growth of new shoots can be prolific and can form impenetrable stands. The first growth of shoots and leaves following cutting are palatable to livestock, including cattle, ponies, donkeys, sheep and goats. The thorns harden by the end of the first season, and this makes blackthorn very resilient to grazing (Day *et al*. 2003). |

|  |  |
| --- | --- |
|  | ***Corylus avellana* (Hazel)**  Hazel is a multi-stemmed shrub and it can sprout from surface shoots and layered stems and regrows from coppiced stem. Established bushes are moderately susceptible to grazing by cattle, goats and sheep (Day *et al*. 2003).  . |

#### Other scrub species on the islands which are not an encroachment threat

|  |  |
| --- | --- |
|  | ***Crataegus monogyna* (Hawthorn)**  Hawthorn is a scrub forming species but does not form a scrub encroaching issue on the Aran Islands. |
|  | **Rosa spinossima (Burnet rose)**  Burnet rose is part of the shrub flora typical of Orchid-rich grassland and Limestone pavement. It does not form a scrub encroachment issue. Burnet Rose is one of the positive indicator species of Annex I priority habitat Limestone Pavement. |
|  | **Juniperus communis (Juniper)**  Juniper is one of only three native conifer species in Ireland, the others being yew and scot’s pine. In other parts of Europe, juniper grows as an upright tree whilst on the Aran Islands it has a prostrate growth form and lies flat on the ground. Juniper is one of the positive indicator species of Annex I priority habitat Limestone pavement. |
|  | ***Ilex aquifolium* (Holly)**  Holly is an evergreen shrub; individual trees may be male or female with the red berries only produced by female trees. Holly cannot withstand heavy pruning and will die if cut severely. |
|  | ***Euonymous europaeus* (Spindle)**  The wood from spindle was used to make spindles for spinning wheels. In autumn it produces pink 4-lobed fruit. |
| http://www.florafinder.com/LargePhotos/D3/Rhamnus_cathartica-A3BC940703.jpg | **Rhamnus cathartica (Buckthorn)**  Buckthorn is an uncommon shrub in Ireland and is the food plant of the brimstone butterfly. Buckthorn is one of the positive indicator of Annex I priority habitat Limestone Pavement. |

#### Conditions that favour scrub establishment and growth

**Decline in grazing - Undergrazing**

The poor economics of farming on the islands has led to changing practices in the form of land abandonment and/or sub-optimal grazing. This lack of agricultural activity leads to an increase in scrub, particularly briars and blackthorn. This has resulted in the development of species-poor grassland and/or scrub communities at the expense of the species-rich grasslands, and has caused a visual change in the island, with not only grasslands disappearing, but the field wall structure being engulfed by the encroaching scrub.

**Winterage system and rotational grazing**

The Winterage system is ideally suited to the growth of the undesirable scrub species. Fields are grazed for a few weeks during the winter, when the deciduous target scrub species have lost their leaves and so are less prone to damage. The fields are largely ungrazed for the rest of the year allowing scrub species to spread unchecked during their growing phase.

**Sheltered sites and deep soils**

On sheltered sites, undergrazing can lead to scrub encroachment, particularly briars. On sites where soil fertility may be higher due to depth of soil, for example, briars can quickly dominate a field at the expense of other grassland species (Fig. 6).

|  |  |
| --- | --- |
|  |  |

Fig. 6. Heavily scrub encroached field (left) and after scrub control (right)

**Decline in traditional practices of scrub management**

In the past, scrub cutting was an integral part of farm management and use was made of every stick and twig that was cut, with woody material used to light fires. As all farm income came from farming, there was a greater reliance on the farm to provide for the family and, accordingly, more time was spent on farm management. Nowadays, less time is available for the targeted grazing necessary, and the labour involved with it, such as carrying water to fields, so that they can be grazed tightly.

**Reduction in diversity of livestock types**

Traditionally, Aran farms supported a variety of livestock. Each farm had a cow for milking, some goats and sheep as well as cattle. Donkeys and horses were also an integral part of the farm, and goats often followed cattle as part of the grazing rotation, and were instrumental in keeping the scrub in check. Changing agricultural practices have reduced the need for different livestock types (Fig. 7).

|  |  |
| --- | --- |
|  |  |

**Fig. 7. Other livestock, such as donkeys and goats, can assist in scrub control by browsing scrub regrowth**

# Methodology

A variety of methods were tested to see if they were useful tools in monitoring the impact of the project actions on the conservation status of the priority habitats in the context of the Aran Islands. Comparing vegetation in relevés makes up the main body of the work.

## Monitoring impact of project actions and vegetation analysis

**Relevés**

Relevés or quadrats were surveyed for their floristic composition and the percentage cover of all plant species within the relevé is estimated and a cover-abundance number from the Domin cover-abundance scale is assigned to each species identified (Table 2).

Table 2. The Domin cover/abundance scale

|  |  |
| --- | --- |
| **% cover/abundance** | **Domin scale** |
| A single individual. No measurable cover | + |
| 1 to 2 individuals. No measurable cover. Individuals with normal vigour | 1 |
| Several individuals but less than 1% cover | 2 |
| 1-4% cover | 3 |
| 5-10% cover | 4 |
| 11-25% cover | 5 |
| 26-33% cover | 6 |
| 34-50% cover | 7 |
| 51-75% cover | 8 |
| 76-90% cover | 9 |
| 91-100% cover | 10 |

The following additional information were also recorded in each relevé: % cover of bare rock, % bare soil, % litter, % grass/sedge layer, % broadleaf layer, % bryophyte layer, median grass and herb height.

A series of fixed point photos were taken of each relevé and a close up photo of the relevé vegetation was also taken.

Relevés were analysed as monitoring stops according to the criteria for assessing conservation status of each of the habitats Orchid-rich calcareous grassland, Machair and Limestone pavement. (O’Neill *et al.* 2013; Ryle *et al.* 2009; Delaney *et al*. 2013, Wilson and Fernández 2013) (Appendix 3). The national assessments have derived indicators of condition and set targets to determine whether Favourable Conservation Status has been achieved.

Machair and calcareous grassland relevés were 4m2 while limestone pavement relevés were 25m2.

**Soil depth**

Soil depth was measured in most relevés using a 28 cm soil stick. Five sample depths were recorded and an average was taken. When 1 or more of the readings was greater than 28cm, the average of the other readings is also given, e.g. 10, >28

**Transects**

A series of 15 transects were set up in a range of scrub densities following cutting actions (Fig. 8). The percentage cover as well as the number of stems of each target bracken or scrub species was recorded in 1m2 quadrats every 5m along the transect. To provide information on the character of the vegetation along the transect a 4m2 relevé was recorded along the transect and an accompanying relevé was recorded in the main body of the field in ‘ideal’ vegetation. The graphs of the data for the bracken and scrub species are in Appendix III. This data is referred to in the results section.

|  |  |
| --- | --- |
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Fig.8. Transect (T2IMR) running through dense scrub (indicated by red), to monitor regrowth of scrub following cutting (photo on the right).

**Repeat relevés**

Repeat relevés were taken in scrub patches either before cutting or after cutting and then repeated one, two or three years later (Fig. 9)

|  |  |
| --- | --- |
| 2014 | 2017 |

Fig. 9. Photo of repeat relevé. Relevé first taken before scrub cutting in 2014 and then repeated in 2017 following scrub cutting

**Paired relevés**

Paired relevés were used for assessing the regrowth vegetation in scrub patches. One relevé was recorded within the scrub patch and another was recorded from vegetation unaffected by scrub encroachment. This analysis enabled assessment of the developing vegetation after cutting or treatment, and helped determine if the vegetation in the scrub patch was approaching the ideal vegetation present within the same field. All transects were accompanied by a set of paired relevés.

**‘5 star’ relevés**

During the course of the survey work, many areas were encountered that were perceived to be excellent examples of species-rich grassland. Relevés taken in such areas were labelled ‘5 star’ and analysis of these relevés enabled analysis of the character of high quality grassland vegetation and sets standards for orchid-rich grassland in the context of the Aran Islands.

## Conservation Assessments of the Priority Habitats: 6210\* Orchid-rich calcareous grassland, 8240\* Limestone pavement, 21A0\* Machair.

The full list of indicator species for orchid-rich calcareous grassland, Limestone pavement and Machair are in Appendix 1. Below are the summary of the targets that are used to assign ‘Pass’ or ‘Fail’ status to the relevés described in the Results section.

**Conservation Assessment Targets for Machair**

For a monitoring stop or relevé to pass the conservation assessment for Machair vegetation it must have at least 3 positive indicator species in every stop; more than 1% cover of bryophytes; and a combine cover of less than 5% negative species. Each parameter must be passed to pass the conservation assessment.

|  |  |
| --- | --- |
|  | **Targets for stop to ‘Pass’** |
| Positive Indicator species | At least 3 present in every stop |
| % cover of bryophytes | Always > 1% |
| Combined cover of negative species | < 5% |

Table 3. Summary of parameters required for monitoring stop to ‘Pass’ conservation assessment of Machair

For example,

|  |  |  |
| --- | --- | --- |
| PASS | FAIL | PASS |

Means that the relevé fails the overall assessment due to insufficient bryophyte cover, even though it passed the targets for positive and negative species.

**Conservation Assessment Targets for Orchid-rich Calcareous Grassland**

For a monitoring stop or relevé to pass the conservation assessment for Orchid-rich calcareous grassland vegetation it must have at least 2 high quality indicator species; 7 positive indicator species; less than 20% combined cover of negative species and less than 5% cover of scrub or bracken in every stop (Table 4).

|  |  |
| --- | --- |
|  | **Targets for stop to ‘Pass’** |
| High quality indicator species | ≥ 2 present |
| Positive Indicator species | ≥ 7 present |
| Combined cover of negative species | ≤ 20% |
| Cover of scrub or bracken | ≤ 5% |

Table 4. Summary of parameters required for monitoring stop to ‘Pass’ conservation assessment of Orchid-rich calcareous grassland

Following analysis the vegetation analysis of land parcels with high scores, an additional set of positive indicator species were regularly found in high quality fields and absent from fields that were more semi-natural in character (Table 5). More details of this can be found in the following report: ‘Ecosystems functions and restoration II-Optimal grazing scores’.

|  |  |
| --- | --- |
| *Agrimonia\_eupatoria* | Hemp agrimony |
| *Euphrasia\_officinalis\_agg* | *Eyebright* |
| *Plantago\_maritima* | *Sea plantain* |
| *Polygala\_vulgaris* | *Common milkwort* |
| *Rhinanthus\_minor* | *Yellow rattle* |
| *Succisa\_pratensis* | *Devil’s bit scabious* |
| *Calluna\_vulgaris* | *Ling heather* |

Table 5.. List of additional positive indicator species that are consistently found in grasslands of high conservation value in the context of the Aran Islands.

In the following results section, relevés were analysed for presence of high quality, and positive indicator species as once these targets were met negative species or overdominance of scrub or bracken was not an issue. Relevés were also analysed for the presence of positive species in context of the Aran Islands (Table 5) and relevés which passed this criteria with additional Aran Island positive species are shown highlighted in yellow. For example a relevé that receives the following analysis,

|  |  |  |
| --- | --- | --- |
| PASS | PASS | PASS |

has passed the targets for high quality species (dark green), positive indicator species (light green), and positive indicator species in island context (yellow) and hence has passed the overall conservation assessment.

**Conservation Assessment Targets for Limestone Pavement**

|  |  |
| --- | --- |
|  | **Targets for stop to ‘Pass’** |
| Positive indicator Species | ≥7 present |
| Combined cover of negative species | ≤ 1% |
| Bracken cover | ≤ 10% |
| Scrub cover | ≤ 25% |

Table 6. Summary targets for conservation assessment for Limestone pavement

For a relevé in Limestone pavement to pass the conservation assessment there must be greater than 7 positive indicator species present; the combined cover of negative species must be less than or equal to 1%; the cover of bracken must be less than or equal to 10% and scrub cover must not exceed 25% (Table 6).

## Vegetation communities

Vegetation communities for relevé data was ascertained using ERICA web application, which assigns communities defined by the Irish Vegetation Classification (IVC) (Perrin 2018). <http://www.biodiversityireland.ie/projects/national-vegetation-database/irish-vegetation-classification/erica/>

## Scrub densities

When Scrub patches were being mapped for the farm plan, an estimate of the density of the scrub was given based on the percentage cover within the scrub patch. In ‘Heavy’ scrub, 76% to 100% of the area is covered in scrub; in ‘Medium’ scrub, 41% to 75% of the scrub patch is covered in scrub and in ‘Light’ scrub, 15% to 40% of the patch is covered in scrub. Patches dominated by bracken were deemed Light density.

## Optimal grazing score

Each land parcel included in the project received a 1-5 score with five being top quality priority habitat (Table 7).

Table 7. The AranLife scoring system.

|  |  |
| --- | --- |
| **Score 5** representsgood quality priority habitat. It is  well managed with an appropriate grazing regime which usually involves grazing to a short turf in winter but may also involve a flash grazing during the summer if grass growth is good.  A score 5 has a high-species diversity with frequent positive indicator species, producing a colourful array of flowers during the summer months including an abundance of orchid species. No fertiliser is applied to this grassland as doing so would reduce the species diversity significantly. Since the grazing intensity is at an optimum level, scrub and bracken encroachment is not an issue or has been rectified by cutting. |  |
| In **Score 4** Priority habitat is present and it has a high-species diversity with frequently occurring positive indicator species. The grazing level is appropriate for the most part however scrub or bracken encroachment an issue. |  |
| **Score 3b is** priority habitat with reduced no of positive indicator species. It has a low species because of the inadequate grazing levels which favours a dominance of rank tall grasses and a higher sward height in summer which shades out the herbaceous species typical of calcareous grassland. Scrub or bracken is an issue in these fields which is also a consequence of the sub-optimal grazing regime. |  |
| **Score 3a covers a**reas of priority habitat either not in agricultural use or where grazing is not occurring or where the grazing rate is so low it there is a substantial build-up of grass. |  |
| **Score 2 reresents** Semi-improved grassland with limited indicators of priority habitat,  The vegetation is grass dominated, with higher levels of fertility or more recently made grasslands. This grassland type does not receive any payment. | C:\Users\brownea\Pictures\photos\Releve photos\Inis Oirr\IMG_4420.JPG |
| **Score 1**  Non-priority habitat or not one of the three habitats Orchid-rich grassland, limestone pavement or machair and therefore not covered by the LIFE project. |  |

# Results

## Assessment of impact of cutting trials on bracken regrowth on Machair

1. Transects

1m2 plots every 5m. Stem count and % cover of target species recorded. Paired relevé for analysis of the vegetation also recorded.

|  |  |
| --- | --- |
| **Transect code** | **T1IMN** |
| **Habitat** | **Machair** |
| **Target Species** | **bracken** |
| **Density** | **Light** |
| **Treatment** | **Cut 2015, 2016, 2017 (twice cut annually in late May and 6 weeks later)** |

|  |  |  |
| --- | --- | --- |
| 2014 | 2017 | 2018 |
|  |  |  |

Fig.10. View of transect T1IMN.

|  |  |
| --- | --- |
|  |  |

Fig.11. After 3 consecutive years of twice cutting annually, occasional bracken fronds are still present but cover is significantly reduced across the transect.

**Vegetation Assessment**

|  |  |  |
| --- | --- | --- |
| R15IMN 8/9/14  Relevé in bracken | 23/8/17  Relevé in bracken | 16/5/18  Relevé in bracken |
|  |  |  |
|  |  |  |
|  |  |  |
| SCORE 4 | SCORE 5 | SCORE 5 |
| GL3C Festuca rubra - Plantago lanceolata | GL3C Festuca rubra - Plantago lanceolata | GL3C Festuca rubra - Plantago lanceolata |
| |  |  |  | | --- | --- | --- | | Pass | Pass | Fail | | |  |  |  | | --- | --- | --- | | Pass | Pass | Fail | | |  |  |  | | --- | --- | --- | | Pass | Pass | Fail | |

**Summary**

Following the bi-annual cutting of bracken over a period of 3 years, bracken dominance has been considerably reduced (Fig. 10 & 11). Continued cutting will be necessary for maintain control. Following bracken control %cover of bracken has gone from 41% (2014) to 8% (2018), however, this is over the 5% target for bracken cover for a monitoring stop to achieve a favourable conservation status. Even with Bracken dominance in 2014, the relevé passed the criteria of positive indicator species and bryophyte cover. Since the issue of bracken dominance has been controlled the score of the L.P went from 4 to 5. The >5% target for bracken for each monitoring stop, seems a bit excessive and a combined cover per field or for a number of monitoring stops may be a more reasonable target in the context of the Aran Islands.

|  |  |
| --- | --- |
| **Transect code** | **T2IMN** |
| **Habitat** | **Machair** |
| **Target Species** | **bracken** |
| **Density** | **Light** |
| **Treatment** | **Cut twice 2015 and 2016** |

|  |  |  |
| --- | --- | --- |
| **2014** | **2017** | **2018** |
|  |  |  |

**Fig.12. View of Transect T2IMN.**

Fig. 13.Twice cutting for two years reduces number of bracken stalks and cover, however once cutting is stopped bracken increases in number of stems and cover.

**Vegetation assessment**

|  |  |  |
| --- | --- | --- |
| R17IMN 8/9/14 | 21/8/17 | 16/5/18 |
|  |  |  |
|  |  |  |
|  |  |  |
| SCORE 4 | SCORE 4 | SCORE 4 |
| GL3C Festuca rubra - Plantago lanceolata | GL3A Briza media- Thymus polytrichus | GL3C Festuca rubra - Plantago lanceolate |
| |  |  |  | | --- | --- | --- | | PASS | Pass | Fail | | |  |  |  | | --- | --- | --- | | PASS | Pass | Pass | | |  |  |  | | --- | --- | --- | | FAIL | Pass | Pass | |

**Summary**

After two years of cutting the vegetation passes the positive species, bryophyte cover and bracken cover targets (Fig.12 & 13). Once cutting ceases, however, number of bracken stems and cover increase somewhat and possibly impact negatively on positive species number resulting in fail for positive species target in 2018. The twice cutting in summer may also impact temporarily on the species number as would summer grazing before second bracken cut.

|  |  |
| --- | --- |
| **Transect code** | **T12IMN** |
| **Habitat** | **Machair** |
| **Target Species** | **Bracken** |
| **Density** | **Light** |
| **Treatment** | **Cut 2015, 2016, 2017** |

|  |  |  |
| --- | --- | --- |
| **2016** | **2017** | **2018** |
|  |  |  |

Fig.14. View of bracken transect T12IMN

Fig.15. Bracken cover and abundance dramatically reduced with twice yearly annual cutting regime

|  |  |  |
| --- | --- | --- |
| R17IMN 8/9/14 Relevé in bracken | 21/8/17 Relevé in bracken | 16/5/18 Relevé in bracken |
|  |  |  |
|  |  |  |
|  |  |  |
| SCORE 4 | SCORE 4 | SCORE 4 |
| GL3C Festuca rubra - Plantago lanceolata | GL3A Briza media- Thymus polytrichus | GL3C Festuca rubra - Plantago lanceolata |
| |  |  |  | | --- | --- | --- | | PASS | Pass | Fail | | |  |  |  | | --- | --- | --- | | PASS | Pass | Pass | | |  |  |  | | --- | --- | --- | | FAIL | Pass | Pass | |

**Summary**

Even though bracken cover was dramatically reduced after first year of cutting from 8% down to 0.1% (Fig.15 &16), the number of positive indicator species dropped from 8 to 5 and hence below the positive indicator species target in 2018 and fail result for this criteria. It is possible that the summer cutting regime has a negative impact on the positive indicator species in the short term. Summer grazing may also have an impact on the species diversity.

## Assessment of impact of cutting trials for scrub and bracken on Orchid-rich calcareous grassland

|  |  |
| --- | --- |
| **Transect code** | **T10IMN** |
| **Habitat** | Orchid-rich grassland |
| **Target Species** | bracken, briar |
| **Density** | Heavy |
| **Treatment** | Cut once jan/feb 2015 |

|  |  |
| --- | --- |
| **2015 after first cut** | **2017** |
|  |  |
|  |  |

**Fig.16. View of transect T10IMN, scrub regrowth after first cut.**

Fig. 17. Transect T10IMN, change % cover of bracken, briars and blackthorn along transect from 2015 after first cut to 2017, two years after first cut.

**Summary**

After one cut, all target species increased two years after the first cut in January 2015 (Fig. 16 &17). In some of the plots, as the bracken decreases in cover, the briars increase in cover (0m, 10m, 25m). In other plots the bracken increases while the briars show a decrease (5m). In other plots both bracken and briars increase cover (15m and 30m).

**Vegetation analysis**

|  |  |  |  |
| --- | --- | --- | --- |
| R24IMN 1/7/15 | 29/6/17 | R25IMN 1/7/15 | 29/6/17 |
| CUT/HEAVY, regrowth after first cut | | Outside scrub patch | |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
| SCORE 4 | SCORE 5 | SCORE 4 | SCORE 5 |
| GL3C Festuca rubra - Plantago lanceolata | GL3C Festuca rubra - Plantago lanceolata | GL3A Briza media - Thymus polytrichus | GL3A Briza media - Thymus polytrichus |
| |  |  |  | | --- | --- | --- | | FAIL | FAIL | FAIL | | |  |  |  | | --- | --- | --- | | PASS | FAIL | **FAIL** | | |  |  |  | | --- | --- | --- | | PASS | PASS | PASS | | |  |  |  | | --- | --- | --- | | PASS | PASS | PASS | |

After one cut in winter of the target scrub species, the number of high quality indicator species increases and passes this target, however the vegetation in the scrub patch is not at the same quality as the majority of the field. The field edge vegetation is referable to GL3C *Festuca rubra-Plantago lanceolata* community, which occurs in more fertile sites than GL3A *Briza media-Thymus polytrichus* which is the ‘ideal vegetatation’ as seen outside the scrub patch and in the main body of the field. GL3A *Briza media-Thymus polytrichus* is synonymous with Orchid-rich calcareous grassland vegetation. Since the scrub was set back by cutting, the score of the field increased from a 4 to 5.

|  |  |
| --- | --- |
| **Transect code** | **T11IMN** |
| **Habitat`** | **Orchid rich grassland** |
| **Target Species** | **bracken and briars** |
| **Treatment** | **Cut 2015, tightly grazed Apr 2015 with horse. Spot application of briars with Roundup at start of the transect as part of farmer demonstration in June 2015.** |

|  |  |
| --- | --- |
| **2015** | **2017** |
|  |  |
|  |  |

**Fig. 18. View of transect T11IMN in 2015 after cutting and partial herbicide treatment, and then 2 years after in 2017**

Fig. 19. T11IMN. Change in % cover of bracken, briars and blackthorn in 2015 and 2017 following cutting in January 2015.

**Summary**

After one cut and some spot dabbing of herbicide on the regrowth, the cover of bracken has decreased along the first half of the transect. Similarly briars have also decreased in % cover over most of the transect with increases at 35m only. A new tank was installed along this transect and by providing sufficient water resources to enable optimal grazing and will aid greatly the continued control of the target species of bracken and briars**.**

**Vegetation Assessment**

|  |  |  |  |
| --- | --- | --- | --- |
| R26IMN 1/7/15 | 27/7/17 | R27IMN 1/7/15 | 27/7/17 |
| Relevé in cut, heavy scrub patch | | Releve oustide scrub patch | |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
| SCORE 4 | SCORE 5 | SCORE 4 | SCORE 5 |
| GL3C Festuca rubra - Plantago lanceolata | GL3C Festuca rubra - Plantago lanceolata | GL3A Briza media - Thymus polytrichus | GL3A Briza media - Thymus polytrichus |
| |  |  |  | | --- | --- | --- | | FAIL | FAIL | PASS | | |  |  |  | | --- | --- | --- | | FAIL | FAIL | FAIL | | |  |  |  | | --- | --- | --- | | PASS | PASS | PASS | | |  |  |  | | --- | --- | --- | | PASS | PASS | PASS | |

Vegetation with the exception of the sheltered walls is high quality orchid-rich calcareous grassland. The score of the field has gone for Score 4 to Score 5 owing to the control of scrub through a combination of cutting, grazing and targeted use of herbicide. Vegetation regrowth in the scrub patch is referable to GL3C *Festuca rubra-Plantago lanceolata* vegetation, which is typical of more fertile areas than GL3A *Briza media-Thymus polytrichus* vegetation which occurs in the main body of the field.

|  |  |
| --- | --- |
| **Transect code** | **T13IMN** |
| **Target species** | **Bracken and briars** |
| **Density** | **Medium** |
| **Habitat** | **Orchd-rich calcareous grassland** |
| **Treatment** | **One cut and grazed by goats** |

|  |  |
| --- | --- |
| **2016 After first cut** | **2017 regrowth one year after first cut** |
|  |  |
|  |  |

**Fig. 20. View of transect T13IMN following cutting**

Fig 21. The change in % cover of the target species following cutting.

**Summary**

The cover of bracken is reduced one year after cutting over most of the transect (Fig. 20 &21). The cover of briars varies between increasing and decreasing along the transect. Blackthorn has reduced in cover (5m).

**Vegetation Assessment**

|  |  |  |  |
| --- | --- | --- | --- |
| Releve within scrub patch | | Releve outside the scrub patch | |
| R106IMN 18/8/16 | 23/8/17 | R107IMN 18/8/16 | 23/8/17 |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
| GL3C Festuca rubra-Plantago lanceolata | GL3A Briza media-Thymus polytrichus | GL3A Briza media-Thymus polytrichus | GL3A Briza media-Thymus polytrichus |
| |  |  |  | | --- | --- | --- | | PASS | FAIL | PASS | | |  |  |  | | --- | --- | --- | | PASS | PASS | PASS | | |  |  |  | | --- | --- | --- | | PASS | PASS | PASS | | |  |  |  | | --- | --- | --- | | PASS | PASS | PASS | |
| Score 4 | Score 4 | Score 4 | Score 4 |

After the first cut the target scrub and bracken species have reduced in cover and abundance owing to the follow up grazing with goats. The reduction in scrub cover has contributed to the development of orchid-rich calcareous grassland vegetation as seen in the alignment of the vegetation with the GL3A *Briza media-Thymus polytrichus* community, which is found in the areas outside the scrub patch and not impacted on by scrub encroachment. This field is part of a larger land parcel (LP) and scrub encroachment is still an issue over the LP as a whole so the grazing score remains at 4.

|  |  |
| --- | --- |
| **Transect code** | **T14IMN** |
| **Habitat** | **Orchid-rich calcareous grassland** |
| **Target species** | **bracken and briars** |
| **Density** | **Medium** |
| **Treatment** | **uncut** |

|  |  |
| --- | --- |
| **2016 M** | **2017** |
|  |  |
|  |  |

**Fig.22. View of transect T14IMN in 2016 and 2017**

**Fig.23. Change in cover of target species in 2016 and 2017.**

**Summary**

When left uncut, the number of individuals of bracken increases though the % cover decreases throughout this transect (Fig 22 & 23). Similarly with briars, the number of individuals increases and the % cover decreases. Bracken and briar cover appear to be reducing for most of the transect. The cover of blackthorn increases in one plot (15m) which may account somewhat for the decrease in briars and bracken. This analysis does not measure further encroachment of bracken and briars into the field, when left uncut.

**Vegetation Assessment**

|  |  |  |  |
| --- | --- | --- | --- |
| Relevé in uncut scrub patch | | Releve outside scrub patch | |
| R110IMN 19/8/16 | R110IMN 23/8/17 | R111IMN19/8/16 | R111IMN 23/8/17 |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
| GL3C Festucarubra-Plantago lanceolata | GL3C Festucarubra-Plantago lanceolata | GL3C Festucarubra-Plantago lanceolata | GL3C Festucarubra-Plantago lanceolata |
| |  |  |  | | --- | --- | --- | | PASS | FAIL | PASS | | |  |  |  | | --- | --- | --- | | PASS | FAIL | PASS | | |  |  |  | | --- | --- | --- | | PASS | PASS | PASS | | |  |  |  | | --- | --- | --- | | PASS | FAIL | FAIL | |
| Score 4 | Score 5 | Score 4 | Score 5 |

The transect data analysis did not show the spread of scrub that is left uncut, however, the comparison of relevés taken with in the scrub patch paired with relevé taken outside the scrub patch show a reduction in vegetation quality outside the scrub patch. This control relevé has a reduction in positive indicator species, however the vegetation is not orchid rich grassland quality and hence the vegetation is not aligned with GL3A *Briza media-Thymus polytrichus* community. This field is part of a much larger LP which had extensive scrub cutting as well as a new tank to improve grazing levels hence the score went from a 4 to a 5.

|  |  |
| --- | --- |
| **Transect code** | **T2IMR** |
| **Target species** | **bracken and briars** |
| **Habitat** | **Orchid-Rich Grassland** |
| **Treatment** | **Heavy scrub cleared jan 15. Grazed by goat and horse, recut and regrowth treated with Garlon** |

|  |  |
| --- | --- |
| **2015** | **2017** |
|  |  |

Fig. 23. View of transect T2IMR

Fig. 24. Change in cover of target species in 2015 and 2017 following cutting, grazing and herbicide treatments

**Summary**

All scrub and bracken cover reduced considerably by cutting, recutting followed by treating regrowth with herbicide (Fig.23 & 24). Grazing the regrowth prior to herbicide treatment (Garlon) also contributed to successful clearing of scrub in this field. Surprisingly Hazel regrowth growth was unaffected by herbicide which may have been due to incorrect application methods.

**Vegetation Assessment**

|  |  |  |  |
| --- | --- | --- | --- |
| **R25IMR 19/5/15** | **R25IMR 21/7/16** | **R50IMR 2015** | **R50IMR 2016** |
| In scrub patch | In scrub patch | In control | In control |
| |  |  |  | | --- | --- | --- | | FAIL | FAIL | FAIL | | |  |  |  | | --- | --- | --- | | FAIL | FAIL | FAIL | | |  |  |  | | --- | --- | --- | | PASS | PASS | PASS | | |  |  |  | | --- | --- | --- | | PASS | PASS | PASS | |
| None | GL2 Holcus lanatus-Lolium perenne | GL3A Briza media - Thymus polytrichus | GL3A Briza media - Thymus polytrichus |
| Score 4 | Score 2 | Score 4 | Score 2 |

Once cleared the developing vegetation in most of the field underlying the scrub is not typical of orchid-rich grassland and resembles more semi-improved vegetation. The soil depth under the scrub is 19.2 cm which is relatively deep for Aran soils and explains the greater fertility and poorer conservation value vegetation. The higher fertility also explains the development of dense scrub. GL2 *Holcus lanatus-Lolium perenne* is a community that represents variable semi-improved vegetation. It is species-poor and of low conservation value (O’Neill *et al*. 2013). This field is summer grazed which would help in the control of scrub but would also impact on the conservation value of the vegetation by reducing the diversity of positive indicator species. The control relevé was located in a small isolated pert of the field with some rock outcropping and is not indicative of the vegetation in the main body of the field.

|  |  |
| --- | --- |
| **Transect code** | **T3 IMR** |
| **Habitat** | **Orchid-rich calcareous grassland** |
| **Target species** | **bracken briars** |
| **Density** | **Medium** |
| **Treatment** | **Repeated cutting, followed by grazing by horses after cattle** |

|  |  |
| --- | --- |
| **2015** | **2017** |
|  |  |

Fig.25. View of transect T3IMR after cutting in 2015 and 2 years later in 2017.

Fig. 26. Change in cover of target species in 2015 after cutting and 2 years later in 2017.

**Summary**

After repeated cutting and target grazing actions, there has been an overall reduction in all target scrub and bracken species (Fig. 25 & 26)

**Vegetation Analysis**

|  |  |  |  |
| --- | --- | --- | --- |
| **R25IMR 19/5/15**  **IN SCRUB PATCH** | **17/5/17**  **IN SCRUB PATCH** | **R52 IMR 6/8//15**  **CONTROL** | **17/5/17**  **CONTROL** |
| **GL3A** Briza media - Thymus polytrichus | **GL3C** Festuca rubra - Plantago lanceolata | **GL3A** Briza media - Thymus polytrichus | **GL3A** Briza media - Thymus polytrichus |
| |  |  |  | | --- | --- | --- | | PASS | FAIL | PASS | | |  |  |  | | --- | --- | --- | | PASS | FAIL | PASS | | |  |  |  | | --- | --- | --- | | PASS | PASS | PASS | | |  |  |  | | --- | --- | --- | | PASS | PASS | PASS | |
| **SCORE 4** | **SCORE 5** | **SCORE 4** | **SCORE 5** |

Both relevés taken within the scrub patch in 2015 and 2017, failed on the number of positive indicator species criteria, even though vegetation aligned with GL3A *Briza media-Thymus polytrichus* community which would be most representative of orchid-rich calcareous grassland. All relevés pass the criteria for both number of high quality indicator species (dark green) and positive indicator species with AranLIFE species added to the list (yellow). Since the rest of the field supports orchid-rich calcareous grassland as seen in the control relevé and the scrub has been kept under control the score has gone from 4 to 5.

|  |  |
| --- | --- |
| Transect code | T4IMR |
| Habitat | Orchid-rich calcareous grassland |
| Target species | bracken and briars |
| Density | Medium |
| Treatment | Cut once in Jan/Feb 2015 |

|  |  |
| --- | --- |
| **2015 regrowth after first cut** | **2017 Regrowth two years after first cut** |
|  |  |
|  |  |

Fig.27. View of transect T4IMR in 2015 and 2017 following cutting.

Fig.28. T4IMR: Change in cover of target species in 2015 and 2017.

**Summary**

There is an overall increase in cover and abundance of bracken, briars and blackthorn two years after first cut.

**Vegetation Analysis**

|  |  |  |  |
| --- | --- | --- | --- |
| R27IMR 20/5/15  In Scrub | R27IMR 20/05/17  In Scrub |  | R122 IMR 20/5/17  CONTROL |
| GL3C Festuca rubra - Plantago lanceolata | GL3C Festuca rubra - Plantago lanceolata |  | GL3 Briza media - Thymus polytrichus |
| Score 3 | Score 3b |  | Score 3b |
| |  |  |  | | --- | --- | --- | | PASS | FAIL | FAIL | | |  |  |  | | --- | --- | --- | | PASS | FAIL | FAIL | |  | |  |  |  | | --- | --- | --- | | PASS | FAIL | PASS | |

One cut of the target scrub species does not improve the conservation value of the vegetation. The control vegetation is aligned with GL3A *Briza media-Thymus polytrichus* and orchid-rich calcareous grassland vegetation, however, this field and land parcel is undegrazed leading to the grazing score of 3b. Achieving optimum grazing in this field would help to achieve grassland of higher conservation value as well as help control scrub.

|  |  |
| --- | --- |
| **Transect code** | **T5IMR** |
| **Habitat** | **Orchid-rich calcareous grassland** |
| **Target species** | **Bracken, briar, blackthorn** |
| **Density** | **Medium** |
| **Treatment** | **Cut once** |

|  |  |
| --- | --- |
| **2014 Scrub density within field before cutting** | **2015 After cutting** |
|  |  |

**Fig.29. View of Transect T5IMR before cutting in 2014 and after cutting in 2015.**

**Fig.30. Change in cover of target species in 2015 and 2017 following cutting.**

**Summary**

Two years following first recut there has been an increase in the cover and abundance of bracken as well as an increase in blackthorn. Briars have reduced in cover somewhat, maybe from competition with blackthorn and bracken.

**Vegetation Analysis**

|  |  |  |  |
| --- | --- | --- | --- |
| **R28IMR 20/5/15** | **R28IMR 30/5/17** | **R45IMR 5/8/15** | **R45IMR 30/5/17** |
| **In scrub patch regrowth after one cut** | **In scrub patch two years after cut** | **Control** | **Control** |
| WL4F Betula pubescens - Pteridium aquilinum | GL3C Festuca rubra - Plantago lanceolata | GL3C Festuca rubra - Plantago lanceolata | GL3C Festuca rubra - Plantago lanceolata |
| Score 5 | Score5 | Score 5 | Score 5 |
| |  |  |  | | --- | --- | --- | | FAIL | FAIL | FAIL | | |  |  |  | | --- | --- | --- | | FAIL | FAIL | PASS | | |  |  |  | | --- | --- | --- | | PASS | PASS | PASS | | |  |  |  | | --- | --- | --- | | PASS | PASS | PASS | |

Vegetation in scrub patch develops characteristics of calcareous grassland as it revegetates. Although this vegetation does not pass the targets for number of high quality and positive indicator species, after two years, positive species that are characteristic of calcareous grassland on the Aran Islands are becoming more frequent as indicated by the vegetation passing this target (yellow box).

In the control vegetation, even though the targets for the criteria for high quality and positive species indicators has been passed, the vegetation is assigned to GL3 *Festuca rubra-Plantago lanceolata* community.

|  |  |
| --- | --- |
| **Transect code** | **T6IMR** |
| **Habitat** | **Orchid-rich calcareous grassland** |
| **Target species** | **bracken and briar** |
| **Density** | **Medium** |
| **Treatment** | **cut jan/feb 2015 and re cut summer 2016** |

|  |  |
| --- | --- |
| **2015** | **2017** |
|  |  |
|  |  |

Fig.30. View of transect T6IMR in 2015 and 2017.

Fig. 31. Change in cover of target species in 2015 and 2017.

**Summary**

There is a varied regrowth response in the two years after scrub cutting along the transect (Fig.30 & 31). Overall there is an increase in cover and abundance of bracken, and blackthorn particularly at the edges of the transect. The regrowth response in briar is variable throughout the transect.

**Vegetation analysis**

|  |  |  |  |
| --- | --- | --- | --- |
| **Relevé in scrub patch** | | **Relevé in control** | |
| **R29IMR 17/6/15** | **R29IMR 7/6/17** | **R30IMR 17/6/2015** | **R30IMR 7/6/17** |
| GL3C *Festuca rubra - Plantago lanceolata* | GL3C *Festuca rubra - Plantago lanceolata* | GL3A *Briza media - Thymus polytrichus* | GL3C *Festuca rubra - Plantago lanceolata* |
| **4** | **3b** | **4** | **3b** |
| |  |  |  | | --- | --- | --- | | FAIL | FAIL | FAIL | | |  |  |  | | --- | --- | --- | | FAIL | FAIL | FAIL | | |  |  |  | | --- | --- | --- | | PASS | PASS | PASS | | |  |  |  | | --- | --- | --- | | PASS | PASS | PASS | |

This field is grazed in summer so this may impact on the number of positive indicator species which develop following scrub cutting. Scrub regrowth and undergrazing is still an issue in this field despite the cutting actions hence the field score is 3b in 2017. Even though the vegetation of the control relevé passes the positive indicator species for orchid-rich calcareous grassland, the vegetation is aligned with GL3C *Festuca rubra-Plantago lanceolata* which is indicative of more fertile grassland.

|  |  |
| --- | --- |
| **Transect code** | **T7IMR** |
| **Habitat** | **Orchis-rich calcareous grassland** |
| **Target species** | **bracken and briar** |
| **Density** | **Medium** |
| **Treatment** | **Cut once Jan/Feb 2015** |

|  |  |
| --- | --- |
| **2015 After first cut** | **2017 2 years after first cut** |
|  |  |
|  |  |

**Fig. 32. View of transect T7IMR after cutting.**

Fig. 33. Change of % cover of target species in T7IMR in 2015 and 2017.

**Summary**

In upper section of transect bracken fronds increased in number and % cover while in lower section they decreased in cover and abundance. There is an overall decrease in the no. and percentage cover of briars over the transect, though in the centre of the transect briar regrowth is strong. There is some increase in blackthorn in the centre zone of the transect. In some of the plots, increases in briar cover coincides with a decrease in bracken cover (Fig. 32&33).

**Vegetation analysis**

|  |  |  |  |
| --- | --- | --- | --- |
| **R31IMR1 8/6/15** | **R31IMR 8/6/17** | **R32IMR 8/6/15** | **R32IMR 18/6/17** |
| **In Scrub patch** | **In Scrub patch** | **Control** | **Control** |
| GL3C Festuca rubra - Plantago lanceolata | GL3C Festuca rubra - Plantago lanceolata | GL3A Briza media - Thymus polytrichus | GL3A Briza media - Thymus polytrichus |
| **Score 4** | **Score 4** | **Score 4** | **Score 4** |
| |  |  |  | | --- | --- | --- | | FAIL | FAIL | FAIL | | |  |  |  | | --- | --- | --- | | PASS | FAIL | FAIL | | |  |  |  | | --- | --- | --- | | PASS | PASS | PASS | | |  |  |  | | --- | --- | --- | | PASS | PASS | PASS | |

Two years after cutting the vegetation has a greater number of high quality indicator species present but scrub regrowth is still an issue hence the score of 4. Outside the transect, in vegetation unimpacted on by scrub encroachment, all the positive species targets are met for favourable conservation status. The control vegetation is closely aligned with GL3A Briza media-Thymus polytrichus which represents orchid-rich calcareous grassland.

|  |  |  |
| --- | --- | --- |
| **Transect code** | **T8IO** | |
| **Habitat** | **Orchid rich grassland** | |
| **Target species** | **bracken, briar and blackthorn** | |
| **Treatment** | **Cut once Jan/Feb 2015** |
| **Density** | **Light** |

|  |  |
| --- | --- |
| **2015** | **2017** |
|  |  |
|  |  |
|  |  |

Fig.34. View of transect T8IO in 2015 and 2017 following cutting of light density scrub.

Fig.35. Change in %cover of target species in 2015 and 2017 after cutting.

**Summary**

There is an increase in cover of bracken, particularly at start of transect in the corner of the field. Over the rest of the transect, bracken cover has either reduced or not increased significantly. Over the course of the transect, blackthorn has decreased in cover, 2 years after first cut. There is an overall increase in briar cover along the transect, with particular increase noted at the start of the transect (Fig.34 &35).

**Vegetation analysis**

|  |  |  |  |
| --- | --- | --- | --- |
| **R13IO 22/6/15 in scrub** | **R13IO 12/6/17 in scrub** | **R12IO 22/6/15 Control** | **R12IO 12/6/17 Control** |
| WL3B Alnus glutinosa - Ranunculus repens | GL3C Festuca rubra - Plantago lanceolata | GL3A Briza media - Thymus polytrichus | GL3A Briza media - Thymus polytrichus |
| **Score 4** | **Score 5** | **Score 4** | **Score 5** |
| |  |  |  | | --- | --- | --- | | FAIL | FAIL | FAIL | | |  |  |  | | --- | --- | --- | | PASS | FAIL | FAIL | | |  |  |  | | --- | --- | --- | | PASS | PASS | PASS | | |  |  |  | | --- | --- | --- | | PASS | PASS | PASS | |

Vegetation is approaching target orchid-rich calcareous grassland vegetation in area previously dominated by light density scrub composed of bracken, briar and blackthorn, as target for high quality indicator species has been reached (dark green box). This target in the relevé recorded in the growing season following cutting (2015) had not been achieved indicating that it may take some time for elements of calcareous vegetation to develop in revegetating scrub cut areas.

|  |  |
| --- | --- |
| **Transect code** | **T9IO** |
| **Habitat** | **Orchid-rich calcareous grassland** |
| **Target species** | **bracken, briars and blackthorn** |
| **Density** | **Medium** |
| **Treatment** | **Cut once jan/Feb 2015** |

|  |  |
| --- | --- |
| **2015** | **2017** |
|  |  |
|  |  |

**Fig.36. View of transect T9IO.**

**Fig.36. Change in cover of target species in 2015 and 2017**

**Summary**

There is an overall increase in bracken and briar cover and abundance over the length of the transect. There has been a decrease in blackthorn except for the last plot in transect in sheltered corner where an increase in cover and abundance was noted.

**Vegetation analysis**

|  |  |  |  |
| --- | --- | --- | --- |
| **In Scrub** | | **In Control** | |
| **R18IO 23/6/15** | **R18IO 12/6/17** | **R30IO 23/6/15** | **R30IO 12/6/17** |
| GL3C Festuca rubra - Plantago lanceolata | GL3C Festuca rubra - Plantago lanceolata | GL3A Briza media - Thymus polytrichus | GL3A Briza media - Thymus polytrichus |
| |  |  |  | | --- | --- | --- | | PASS | FAIL | FAIL | | |  |  |  | | --- | --- | --- | | FAIL | FAIL | FAIL | | |  |  |  | | --- | --- | --- | | PASS | PASS | PASS | | |  |  |  | | --- | --- | --- | | PASS | PASS | PASS | |
| **Score 4** | **Score 5** | **Score 4** | **Score 5** |

Regrowth of scrub species in the scrub patch is inhibiting regrowth of species characteristic of orchid-rich calcareous grassland, hence R18IO failed the criteria for positive indicator species two years after cutting. The rest of the LP supports vegetation typical of orchid-rich calcareous grassland (as seen in control vegetation referable to GL3A *Briza media-Thymus polytrichus*) and so following the cutting of scrub, the grazing score went from a 4 (in 2014 before cutting) to a 5 (in 2016 after scrub cutting).

|  |  |
| --- | --- |
| **Transect code** | **T12IO** |
| **Habitat** | **Orchid-rich grassland** |
| **Target species** | **bracken, briars and blackthorn** |
| **Density** | **Light** |
| **Treatment** | **One cut Feb 2016** |

|  |  |
| --- | --- |
| 2016 After first cut | 2017 1 year after first cut |
|  |  |
|  |  |

Fig. 37. View of transect in 2016 and 2017.

Fig. 38. Change in % cover of target species in 2016 and 2017 in transect T12IO.

**Summary**

There is an overall increase in briars, bracken and bracken in the first year following cutting (Fig. 37 & 38).

**Vegetation Analysis**

|  |  |  |  |
| --- | --- | --- | --- |
| **R57IO 12/5/16** | **R57IO 25/5/17** | **R58IO 12/5/16** | **R58IO 25/5/17** |
| **Releve in scrub** | | **Releve in control** | |
| GL3C Festuca rubra - Plantago lanceolata | GL3C Festuca rubra - Plantago lanceolata | GL3C Festuca rubra - Plantago lanceolata | GL3C Festuca rubra - Plantago lanceolata |
| |  |  |  | | --- | --- | --- | | PASS | FAIL | FAIL | | |  |  |  | | --- | --- | --- | | PASS | FAIL | FAIL | | |  |  |  | | --- | --- | --- | | FAIL | FAIL | PASS | | |  |  |  | | --- | --- | --- | | PASS | FAIL | PASS | |
| **Score 4** | **Score 4** | **Score 4** | **Score 4** |

This land parcel (LP) has a scrub encroachment issue throughout due to under grazing. In the scrub patch, following cutting there are some high quality species present in both 2015 and 2017, as the vegetation passed this target (dark green box) so there may be potential for orchid-rich calcareous grassland to develop here if the scrub is kept under control and optimum grazing levels are achieved. The under grazing issue throughout the field is highlighted by the presence of *GL3C Festuca rubra-Plantago lanceolata* community in control vegetation area outside the scrub patch, and a failure to pass all targets, however, the positive indicator species target is passed (yellow box) when AranLIFE positive species are added.

## Repeat relevés

Repeat relevé photos are provided in Appendix II.

**Relevés taken before scrub cutting began and then repeated after cutting**

Table. 8. Relevés that were taken before scrub operations began and then repeated approx. 1.5 years following scrub cutting operations. (Pass/Fail IVC = has ≥2 HQ (high quality) indicator species and ≥6 positive indicator species); Pass/Fail AranLIFE= ≥2 or more HQ species and ≥6 positive indicator species which includes species that are positive indicators in island context.)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Time of first survey** | **Density of scrub** | **Soil depth** | **Repeat cut** | **first relevé**  **Pass/Fail**  **IVC** | **First relevé**  **Pass/Fail**  **AranLIFE** | **repeat relevé**  **IVC** | **Repeat relevé**  **AranLIFE** |
| **R910** | In scrub before cut | **H** | - |  | Fail | Fail | Fail | Fail |
| **R4IMR** | In scrub before cut | **H** | 10.2 | √ | Fail | Fail | Fail | Fail |
| **R8IMR** | In scrub before cut | **L** | 7.25,>28 |  | Fail | Fail | Fail | Pass |
| **R47IO** | In scrub before cut | **H** | 10 |  | Fail | Pass | Fail | Fail |
| **R103IMN** | In scrub before cut | **L** | 11.9 |  | Fail | Fail | Fail | Fail |

All relevés fail the targets for IVC positive indicator species, one relevé passes the indicator species when species particular to high scoring Aran fields are included (Table 8). It should be noted that the soil depth in these relevés is quite high and this increased fertility contributes to the prevalence of scrub as well as accounts for the reduced number of positive indicators of orchid-rich calcareous grassland which would favour more nutrient-poor conditions (Fig 38).

|  |  |
| --- | --- |
| R9IO 5/8/14 | R97IO 9/8/17 |
| Releve before cutting in heavy density scrub | Releve 2 years after cutting |
|  |  |
|  |  |
|  |  |
|  |  |
| Score 4 | Score 5 |
| GL2C Holcus lanatus - Lolium perenne | GL3C Festuca rubra - Plantago lanceolata |
| |  |  |  | | --- | --- | --- | | FAIL | FAIL | FAIL | | |  |  |  | | --- | --- | --- | | FAIL | FAIL | FAIL | |
| GL2C Holcus lanatus - Lolium perenne | GL3C Festuca rubra - Plantago lanceolata |
| |  |  |  | | --- | --- | --- | | FAIL | FAIL | FAIL | | |  |  |  | | --- | --- | --- | | FAIL | FAIL | FAIL | |

Fig. 39 . Example of relevé recorded before and after scrub cutting. T

The regrowth vegetation is aligned with GL3C *Festuca rubra-Plantago lanceolata* vegetation which is synonymous with lowland hay meadows of mineral soils (Fig. 38). This vegetation type can also indicate undergrazing or abandoned meadows (O’Neill *et al*. 2013).

## Relevés taken after scrub cutting and then repeated 1 or 2 years later.

Table 9. Relevés taken within scrub patches after scrub cutting and then repeated 1 or 2 years later. Scrub patches are a range of densities Light (L), Medium (M) and Heavy (H)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Time of first survey | **Density of scrub** | Soil depth | Repeat cut | first relevé  Pass/Fail  IVC | First relevé  Pass/Fail  AranLIFE | repeat relevé  IVC | Repeat relevé  AranLIFE |
| **R23IMR** | In scrub after cut | **L** | - |  | Pass | Pass | Pass | Pass |
| **R70IMR** | In scrub after cut | **M** | 9,>28 |  | Fail | Pass | Fail | Pass |
| **R74IMR** | In scrub after cut | **L** | 9.25,>28 | √ | Fail | Pass | Pass | Pass |
| **R76IMR** | In scrub after cut | **L** | 11.6 |  | Fail | Fail | Fail | Pass |
| **R77IMR** | In scrub after cut | **L** | 13.6 |  | Fail | Fail | Pass | Pass |
| **R78IMR** | In scrub after cut | **L** | 4.6 | √ | Pass | Pass | Fail | Pass |
| **R80IMR** | In scrub after cut | **H** | 6.6 |  | Fail | Fail | Fail | Fail |
| **R82IMR** | In cut scrub after cut | **H** | 8.2 |  | Fail | Fail | Fail | Fail |
| **R83IMR** | In scrub uncut | **M** | 10.5, >28 |  | Fail | Pass | Fail | Pass |
| **R86IMR** | In scrub uncut | **M** | 8 |  | Fail | Fail | Fail | Fail |
| **R89IMR** | In scrub after cut | **L** | 10.4 | √ | Fail | Fail | Fail | Fail |

Five out of six relevés from light density scrub pass the targets for positive species indicators following scrub cutting operations, two of these relevés had the regrowth vegetation cut during the summer which also had an impact in promoting positive indicator species (Table 9). Two out of three relevés that were recorded in medium density scrub also supported sufficient positive indicators to pass this target for assessment. From this it may be concluded that grassland with scrub encroachment at a light or medium density have a better outcome for producing orchid-rich calcareous grassland than areas with heavy density scrub.

So areas with light or medium scrub have a better chance of attaining favourable conservation status following scrub cutting.

## Repeat cutting along with herbicide treatment

These scrub encroached fields that were treated with herbicide, all supported a heavy density of scrub and coarse grasses (Table 10). These fields are all typically summer grazed and have for the most part deeper soils. The recutting followed by herbicide was very effective at tackling the scrub encroachment, however, the underlying vegetation was not orchid rich grassland but more semi-improved in nature and hence all relevés failed the positive indicator targets for orchid-rich calcareous grassland.

Table 10. Repeated relevés in vegetation treated with herbicide

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Time of first survey** | **Density of scrub** | **Soil depth** | **Repeat cut** | **first relevé**  **Pass/Fail**  **IVC** | **First relevé**  **Pass/Fail**  **AranLIFE** | **repeat relevé**  **IVC** | **Repeat relevé**  **AranLIFE** |
| **R24IMR** | After cut Garlon test | **H** | 15.6 | √ | Fail | Fail | Fail | Fail |
| **R92IMR** | After cut Garlon test | **H** | 5.8 | √ | Fail | Fail | Fail | Fail |
| **R79IMR** | In scrub after cut Asulox test | **H** | 13.2 | √ | Fail | Fail | Fail | Fail |

|  |  |
| --- | --- |
| Before cutting 2014 | After cutting 2018 |

Fig. 39. Heavy density scrub cleared with repeated cutting followed by Garlon treatment of the regrowth.

Land that becomes encroached in heavy density scrub tends to support semi-improved grassland once scrub has been cleared owing to the higher levels of fertility (Fig.39).

## Vegetation communities in scrub patches.

Fig.40. Graph showing the grassland communities that the vegetation in scrub patches may be assigned to.

Most of the relevés recorded in scrub patches and repeated following treatments, can be assigned to GL3C *Festuca rubra-Plantago lanceolata* vegetation type (Fig. 40). This grassland type is typical of lowland hay meadow community of mineral soils. This vegetation type is typical of more fertile soils than GL3C *Briza media-Thymus polytrichus* which the vegetation community typical of orchid-rich grassland

## Scrub clearing and optimal grazing score

The scrub cutting operations helps to increase the grazing score over most of the LPs that relevés in scrub patches were recorded in (Fig.41). Even though the vegetation underlying the scrub patch may not be of high conservation status, unlike the vegetation of the majority of the field. Once scrub clearing has been carried out and adequate water provision is supplied, fields can be optimally grazed and attain a high score.

Fig. 41. Graph showing the change in grazing sores of the LPs that the relevés of scrub patches were recorded in, from the date of first relevé to date of repeated relevé which was either one or two years after.

## Paired relevés

Paired relevés consist of one relevé taken within the scrub patch or cleared scrub patch and an accompanying control relevé taken within ‘ideal’ vegetation that makes up the most part of the field (Table 10).

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | SCRUB | | | | | CONTROL | | | | |  |
| **Paired relevés** | **Scrub** | Veg Type | RELEVÉ | | | **Soil depth** | Veg Type | RELEVÉ | | | **Soil depth** | SCORE 2016 |
|  |  |  | IVC HQ | IVC POS | AL  POS |  |  | IVC  HQ | IVC POS | AL POS |  |  |
| **9\_97IO** | **H** | GL3C | FAIL | FAIL | FAIL | **-** | GL3C | FAIL | FAIL | FAIL | 14.6 | 5 |
| **4\_132IMR** | **H** | GL3C | FAIL | FAIL | FAIL | **10.2** | GL3C | PASS | PASS | PASS | 6.6 | 3b |
| **8\_131IMR** | **L** | GL3C | PASS | FAIL | PASS | **7.25, >28** | GL3A | PASS | PASS | PASS | 7.6 | 5 |
| **59\_60IO** | **L** | GL3C | FAIL | FAIL | FAIL | **11.8** | GL3C | PASS | FAIL | PASS | 8.4 | 4 |
| **61\_62IO** | **M** | GL3C | PASS | FAIL | FAIL | **6.4** | GL3C | PASS | PASS | PASS | 11.4 | 5 |
| **65\_64IO** | **M** | GL3A | PASS | FAIL | PASS | **10.9** | GL3A | PASS | PASS | PASS | 10.4 | 5 |
| **68\_69IO** | **M** | GL3C | PASS | FAIL | FAIL | **6.25,>28** | GL3A | PASS | PASS | PASS | 5.7 | 5 |
| **70\_69IMRR** | **M** | GL3C | PASS | FAIL | PASS | **-** | GL3A | PASS | PASS | PASS | - | 5 |
| **74\_73IMR** | **L** | GL3C | PASS | FAIL | PASS | **9.25, >28** | GL3A | PASS | PASS | PASS | 15 | 5 |
| **76\_75IMRR** | **L** | GL3C | PASS | FAIL | PASS | **11.6** | GL3A | PASS | PASS | PASS | 10 | 4 |
| **77\_78IMR** | **L** | GL3C | FAIL | FAIL | FAIL | 13.6 | GL3C | PASS | PASS | PASS | 13.6 | 4 |
| **80-81IMRR** | **H** | GL3C | FAIL | FAIL | FAIL | **-** | GL3A | PASS | PASS | PASS | 6.7 | 5 |
| **83\_84IMRR** | **M** | GL3F | PASS | FAIL | PASS | **10.5, >28** | GL3A | PASS | PASS | PASS | 7.5 | 4 |
| **86\_85IMR** | **M** | GL3C | PASS | FAIL | FAIL | **8** | GL3A | PASS | PASS | PASS | 9.8 | 4 |
| **89\_90IMR** | **L** | GL3C | FAIL | FAIL | FAIL | **10.4** | GL3A | PASS | PASS | PASS | 14.4 | 5 |

Table 10. Conservation assessment of Paired relevés, scrub density, vegetation community, soil depths of scrub and control relevés and grazing score of field or land parcel.

Most of the control relevés that were recorded in pairing with relevés from scrub patches, achieved favourable conservation status using both the IVC set of positive indicator species and the AranLIFE set of positive species that favour high quality grasslands in the context of the Aran Islands. Most of the control relevés are also referable to the vegetation type GL3A *Briza media-Thymus polytrichus*, which is closely aligned with Annex I priority habitat, Orchid-rich calcareous grassland. A large proportion of these relevés supporting vegetation of high conservation value also correlated with high optimal grazing score of 5. Where a score of 4 was given, the vegetation required a higher level of grazing. One paired relevé which was in grassland that received a score of 3b, consisted of GL3C *Festuca rubra-Plantago lanceolata* grassland which is indicative of more fertile ground. This set of paired relevés was located within a small field that is part of a larger land parcel which received a score of 5 for the most part. GL3C *Festuca rubra-Plantago lanceolata* may also represent fields that were once cut for hay (O’Neill *et al*. 2013).

## 5 \* vegetation

As part of the monitoring programme, a large proportion of the relevés recorded were sited in areas of scrub or vegetation that need some change in management to increase its conservation value. Another set of relevés was recorded in vegetation that appeared to be of high conservation value and good examples of high quality orchid-rich calcareous grassland vegetation and these are labelled ‘5\*’ (Fig. 41, 42 & 43). All 5\* relevés passed the criteria for positive species indicators. Species number was high and ranged from 24 to 46 with an average of 33.28 (Table 10).

Fig. 41. Distribution of grazing scores in LPs where 5\* releves were sited.

Fig. 42. The majority of vegetation in 5\* relevés is referable to the vegetation community GL3A *Briza media-Thymus polytrichus*, which is synonymous with 6210 orchid-rich calcareous grassland.

|  |  |
| --- | --- |
|  |  |
|  |  |
|  |  |

Fig.43. Examples of 5\* orchid-rich calcareous grassland

Table 10. 5\* vegetation. Relevés taken from good examples of species-rich calcareous grassland. All pass targets for positive indicator species favourable conservation status. Species diversity ranges from 24 to 46.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 6210 HQ (pass/fail) | 6210 Pos (pass/fail) | 6210 AL Pos (pass/fail) | **IVC code** | **Total species no.** |
| **R3IO** | PASS | PASS | PASS | GL3A | **44** |
| **R10IO** | PASS | PASS | PASS | GL3A | **38** |
| **R16IMR** | PASS | PASS | PASS | GL3A | **33** |
| **R12IOR** | PASS | PASS | PASS | GL3A | **36** |
| **R20IO** | FAIL | FAIL | PASS | GL3A | **40** |
| **R21IO** | PASS | PASS | PASS | GL3A | **38** |
| **R24IO** | PASS | PASS | PASS | GL3A | **37** |
| **R25IO** | PASS | PASS | PASS | GL3A | **34** |
| **R28IO** | PASS | PASS | PASS | GL3A | **43** |
| **R30IOR** | PASS | PASS | PASS | GL3A | **30** |
| **R32IO** | PASS | PASS | PASS | GL3A | **37** |
| **R33IO** | PASS | PASS | PASS | GL3A | **28** |
| **R35IO** | PASS | PASS | PASS | GL3A | **41** |
| **R46IO** | PASS | PASS | PASS | GL3A | **38** |
| **R25IMNR** | PASS | PASS | PASS | GL3A | **43** |
| **R27IMNR** | PASS | PASS | PASS | GL3A | **36** |
| **R43IMN** | PASS | PASS | PASS | GL3A | **34** |
| **R44IMN** | PASS | PASS | PASS | GL3A | **28** |
| **R49IMN** | PASS | PASS | PASS | GL3C | **25** |
| **R50IMN** | PASS | PASS | PASS | GL3A | **40** |
| **R53IMN** | PASS | PASS | PASS | GL3A | **33** |
| **R88IMR** | PASS | PASS | PASS | GL3A | **34** |
| **R30IMRR** | PASS | PASS | PASS | GL3C | **41** |
| **R32IMR** | PASS | PASS | PASS | GL3A | **33** |
| **R45IMRR** | PASS | PASS | PASS | GL3C | **29** |
| **R46IMR** | PASS | PASS | PASS | GL3A | **41** |
| **R47IMR** | PASS | PASS | PASS | GL3A | **29** |
| **R51IMR** | PASS | PASS | PASS | GL3A | **30** |
| **R52IMRR** | PASS | PASS | PASS | GL3A | **30** |
| **R53IMR** | PASS | PASS | PASS | GL3A | **26** |
| **R56IO** | PASS | PASS | PASS | GL3A | **36** |
| **R62IO** | PASS | PASS | PASS | GL3C | **31** |
| **R66IO** | PASS | PASS | PASS | GL3A | **26** |
| **R67IO** | PASS | PASS | PASS | GL3A | **29** |
| **R69IO** | PASS | PASS | PASS | GL3A | **35** |
| **R90IO** | PASS | PASS | PASS | GL3A | **29** |
| **R93IMN** | PASS | PASS | PASS | GL3A | **28** |
| **R94IMN** | PASS | PASS | PASS | GL3A | **28** |
| **R97IMN** | PASS | FAIL | PASS | GL3C | **24** |
| **R71IMR** | PASS | PASS | PASS | GL3A | **29** |
| **R73IMR** | PASS | PASS | PASS | GL3A | **46** |
| **R84IMRR** | PASS | PASS | PASS | GL3A | **31** |
| **R85IMRR** | PASS | PASS | PASS | GL3A | **32** |
| **R90IMR** | PASS | PASS | PASS | GL3A | **32** |
| **R93IMR** | PASS | PASS | PASS | GL3A | **34** |
| **R94IMR** | PASS | PASS | PASS | GL3A | **26** |
| **R95IMR** | PASS | PASS | PASS | GL3A | **25** |
| **R96IMR** | PASS | PASS | PASS | GL3A | **28** |
| **R123IMR** | PASS | PASS | PASS | GL3A | **36** |
| **R131IMR** | PASS | PASS | PASS | GL3A | **30** |

## Other issues

### Purple moor grass

Purple moor grass is a typical wet grassland species and generally occurs on the islands near springs which flood during the winter creating localised wet ground. Purple moor grass is unpalatable to cattle for most of the year except in early summer when the early green shoots first emerge. During Autumn and Winter this grass reabsorbs all nutrients back into its roots leaving the leaves pale and white looking hence the Irish name ‘Fear Bán’ meaning White Grass. If this grass remains ungrazed it out competes the other grassland vegetation leaving the field ungrazeable for much of the year.

Table 11. This relevé recorded in area dominated by *Molinia caerulea* (Purple moor grass). First relevé taken before flash grazing trial and repeat relevé taken after grazing.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Time of first survey** | **Density of scrub** | **Soil depth** | **Repeat cut** | **first relevé**  **Pass/Fail**  **IVC** | **First relevé**  **Pass/Fail**  **AranLIFE** | **repeat relevé**  **IVC** | **Repeat relevé**  **AranLIFE** |
| **R45IMN** | Molinia issue | **Molinia** | 20.25, >28 |  | Fail | Fail | Fail | Pass |

|  |  |
| --- | --- |
| Relevé taken in Molina sward and repeated after flash grazing in July. | |
| R45IMN 18/8/15 *Molinia* issue | 23/8/17 flash grazed July 2017 |
|  |  |
|  |  |
|  |  |
| SCORE 4 | SCORE 4 |
| GL1D Molinia caerulea - Potentilla erecta - Agrostis stolonifera | HE4D Molinia caerulea - Potentilla erecta - Erica tetralix |
| |  |  |  | | --- | --- | --- | | FAIL | FAIL | FAIL | | |  |  |  | | --- | --- | --- | | PASS | FAIL | PASS | |

The flash grazing has resulted in some increase in positive indicator species particularly of positive indicators that are relevant in the Aran Island context.

****

Fig.44. Dense Purple moor grass stands shade out the other grassland vegetation and reduce value of the forage

|  |  |
| --- | --- |
|  |  |

Fig.45. Molinia or Fear Bán in winter (left) and ‘flash’ grazed in summer (right)

In Winter, Purple moor grass (or its more appropriate name at this time of year ‘Fear bán’), absorbs all the plant nutrients back into its roots leaving the leaves white (Fig.45). It is left ungrazed because of its unpalatability at this time. Aflash graze (high number of livestock for a short period) during July well help to reduce the dominance of this grass species as this grass will only be grazed by cattle at this time (Fig. 45).

**Limestone pavement**

Some of the vegetation communities that occur in association with Limestone pavement on Aran Islands include the following (Table 12):

**GL3A *Briza media-Thymus polytrichus***

This community comprises swards of calcareous grassland on shallow, well-drained soils of poor fertility. It is the typical grassland community to be found in association with limestone pavement. This is a very species-rich grassland community of which most examples correspond with the priority EU HD Annex I habitat 6210 Orchid-rich calcareous grassland\*. In addition to supporting populations of rare orchids (e.g. *Gymnadenia conopsea*, *Ophrys apifera*) and being important for a range of pollinators, permanent pastures of this type can be notable for their anthills.

**GL3F *Festuca rubra-Lotus corniculatus***

The *Festuca rubra – Lotus corniculatus* grassland community is a lowland community found along the coast and inland. Soils are dry-humid, rather base-rich, of average fertility and fairly high organic content.

**RH1A *Asplenium trichomanes-Ctenidium molluscum***

This is a sparsely vegetated rocky habitat community that occurs in range of habitats comprising crevices on calcareous cliffs, scree slopes and limestone pavements. Where pockets of soil have accumulated, they are skeletal and conditions are moist, base-rich and infertile.

**RH1B *Teucrium scorodonia-Mycelis muralis***

This is a community of karstic limestone pavement occurring in the lowlands. Soils are skeletal and can be largely confined to the shady grykes, which thus support much of the vegetation. Conditions are base-rich, fairly infertile and fairly dry.

|  |  |
| --- | --- |
|  |  |
|  |  |
|  |  |

Fig. 47. Examples of Limestone pavement types found on the islands

Table 12. Relevés (25m2) taken recorded in Limestone pavement. Comparison of targets reached for conservation assessment, Field scores in 2014 and 2016 and Vegetation type.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **8240 PASS/FAIL POS SP** | **8240 PASS/FAIL NEG SP** | **8240 PASS/FAIL SCRUB COVER** | **Score 2014** | **Score 2016** | **Veg. Type** |  |
| **R2IMN** | PASS | FAIL | PASS | 3 | 5 | GL3A | *Briza media-Thymus polytrichus* |
| **R13IMN** | FAIL | FAIL | FAIL | 4 | 5 | GL3A | *Briza media-Thymus polytrichus* |
| **R5IMR** | PASS | FAIL | PASS | 4 | 5 | RH1B | *Teucrium scordonia-Mycelis muralis* |
| **R13IMR** | PASS | FAIL | PASS | 4 | 5 | GL3A | *Briza media-Thymus polytrichus* |
| **R17IMR** | PASS | FAIL | PASS | - | - | RH1A | *Asplenium trichomanes-Ctenidium molluscum* |
| **R20IMR** | FAIL | FAIL | PASS | 4 | 5 | GL3F | *Festuca rubra-Lotus corniculatus* |
| **R4IO** | FAIL | FAIL | PASS | - | - | RH1A | *Asplenium trichomanes-Ctenidium molluscum* |
| **R6IO** | FAIL | FAIL | PASS | - | - | GL3A | *Briza media-Thymus polytrichus* |
| **R7IO** | PASS | PASS | PASS | 3 | 4 | GL3F | *Festuca rubra-Lotus corniculatus* |
| **R11IO** | PASS | FAIL | PASS | 4 | 5 | GL3A | *Briza media-Thymus polytrichus* |
| **R51IMN** | PASS | FAIL | PASS | 4 | 5 | GL3A | *Briza media-Thymus polytrichus* |
| **R41IO** | FAIL | PASS | PASS | 3 | 4 | GL3A | *Briza media-Thymus polytrichus* |
| **R34IO** | PASS | FAIL | PASS | 4 | 4 | GL3A | *Briza media-Thymus polytrichus* |
| **R11IO** | PASS | FAIL | PASS | 4 | 5 | GL3A | *Briza media-Thymus polytrichus* |

Most of the relevés pass the criteria for positive indicator species (Green box) and scrub cover threshold (Red box), however most relevés fail the target for negative indicator species which has a quite a low threshold of collective cover of 1%. Interestingly Rubus fruticosus is listed as a negative indicator species and a scrub species and most of the relevés fail because the cover *of Rubus fruticosus* is greater than 1% in a 25m2 relevé, which seems to be a very low target threshold.

## Conclusions and Discussion

**Bracken**

1. Bracken control can be achieved by twice annual cutting (first in late May/ early June and second 6 weeks later) ove at least 3 years.
2. The >5% target for bracken per monitoring stop appears to be quite high. Collective cover over a number of stops may be more appropriate in an island context.
3. Twice summer cutting of bracken on Machair may have a temporary impact of reducing positive indicator species. Summer grazing would also reduce positive species number.
4. When bracken occurs in combination with scrub species, it can become a major encroachment issue after the scrub species have been controlled.
5. Asulox herbicide is effective at controlling bracken.

**Scrub**

1. Cutting scrub in winter followed by spot treatment of regrowth by herbicide and tight grazing, reduces scrub and bracken encroachment.
2. Providing sufficient water for optimal grazing is vital in controlling bracken and scrub.
3. Cutting scrub followed by goat grazing helps to keep scrub and bracken in check.
4. In undergrazed fields, areas of scrub at field edge left unchecked, encroach in to main body of the field and reduce vegetation quality.
5. Fields supporting dense scrub tend to have deeper soils and greater fertility. Once scrub is cleared in these fields, the developing vegetation resembles semi-improved grassland rather than orchid-rich calcareous grassland.
6. GL3A *Briza media-Thymus polytrichus* community is synonymous with orchid-rich calcareous grassland, however, vegetation that alligns with GL3C *Festuca rubra-Plantago lanceolata* also passes the target criteria for indicator species for Orchid-rich calcareous grassland.
7. After one cut of scrub and no follow up treatment, positive indicator species may increase over the short term, however scrub encroachment is still an issue.
8. Scrub patches with Light or Medium density encroachment, may have more successful outcome in maintaining orchid-rich calcareous grassland in quality than other heavier scrub densities, following scrub control treatment.
9. Developing vegetation in scrub cleared patches is referrable to GL3C *Festuca rubra-Plantago lanceolata* community rather than GL3A *Briza media-Thymus polytrichus* community. This may be due deeper soils and hence more fertility which is a feature of field edges in general.
10. Scrub cutting operations help to increase the grazing score over most of the LPs, even though the vegetation underlying the scrub patch may not be of high conservation value, unlike the vegetation throughout the most of the field. Once the scrub has been cleared and adequate water provision is supplied, fields can be optimally grazed and attain a high grazing score.
11. There is good correlation between relevés that passed the positive indicator species targets for favourable conservation status, assignment of vegetation to GL3A Briza media-Thymus polytrichus and land parcels achieving an optimal grazing score of 5.

**Molinia**

1. A flash graze of mollinia dominated swards in July, when the grass is palatable to livestock, reduces the dominance of Molinia and encourages diversity of positive species indicators.

**Limestone pavement**

1. The target for negative indicator species in exposed limestone pavement habitat is collective cover ≤1%. Negative indicator species list includes *Rubus fruticosus*. Within a 25m2 relevé a target of <1% is quite a difficult target to achieve, a more appropriate target would be based on a number of stops or on a field basis. The list of scrub species for limestone pavement also includes *Rubus fruticosus* and the target here is combined cover of ≤25%.

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# Appendix 1. National Monitoring Methods - Target Criteria

**8240\* Limestone Pavement (exposed)**

|  |  |
| --- | --- |
| **Positive indicator species: Pass ≥7 present**  **Herbs, grasses woody** | **Ferns** |
| Arabis hirsuta | Adiantum capillus-veneris |
| Asperula cynanchica | Asplenium trichomanes |
| Dryas octapetala | Asplenium ruta-muraria |
| Eupatorium cannabinum | Ceterach offficinarum |
| Geranium sanguineum | Cystopteris fragilis |
| Geranium robertianum | Dryopteris filix-mas |
| Hedera helix | Phyllitis scolopendrium |
| Helianthemum oelandicum | Polystichum aculeatum |
| Junniperus communis | Polystichum setiferum |
| Mycelis muralis |  |
| Plantago maritima | **Bryophytes** |
| Rhamnus cathartica | Breutelia chrysocoma |
| Rosa spinosissima | Conocephalum conicum |
| Rubia peregrina | Ctenidium molluscum |
| Rubus saxatilis | Fissidens spp. |
| Saxifraga hypnoides | Neckera crispa |
| Sesleria caerulea | Tortella tortuosa |
| Taxus baccata |  |
| Teucrium scorodonia | **Orchids** |
| Thalictrum minus | Epipactis atrorubens |
| Thymus polytrichus | Orchis mascula |
| Viola spp. |  |
|  |  |
| **Negative Indicator species: Collective cover ≤ 1%:** Arrhenatherum elatius, Cirsium arvense, Cirsium vulgare, Lolium perenne, Rubus fruticosus, Urtica dioica. | **Bracken cover: Pass= Collective cover ≤10%** |
| **Indicators of local distinctiveness/Notable species:** Notable species: Potentilla fruticosus, Red Data species (e.g. Calamagrostis epigojos, Frangula alnus, Gymnocarpium robertianum, Viola hirta. | **Non-native species cover: Pass = collective cover ≤ 1%:** Acer pseudoplatanus, Cotoneaster spp., Clematis vitalba, Centranthus ruber |
| **Vegetation structure: Scrub cover: Pass = collective cover ≤ 25%** | |
| Corylus avellana, Crataegus monogyna, Euonymous europaeus, Fraxinus excelsior, Ilex aquifolium, Prunus spinose, Rhamnus cathartica, Rubus saxatilis, Rubus fruticosus agg. Rosa micrantha, Rosa spinosissima, Salix spp., Sorbus aria, Sorbus aucuparia, Viburnum opulus. | |

**21A0\* Machairs**

The following tables show the criteria used to assess the conservation status at a monitoring stop and site level (Delaney *et al.* 2013) (Table 3). A monitoring stop or relevé must support greater than 6 positive indicator species, a low percentage cover of negative indicator species and more than 1% cover of bryophytes to pass and have favourable conservation status.

**Table 3. Criteria to pass/fail monitoring stops in the assessment of conservation status**

|  |
| --- |
| **1a. Positive species indicators: At least six must be present in more than 20% stops to pass** |
| *Agrostis stolonifera* |
| *Aira praecox* |
| *Bellis perennis* |
| *Carex arenaria* |
| *Carex flacca* |
| *Carex nigra* |
| *Cerastium fontanum* |
| *Crepis capillaris* |
| *Euphrasia officinalis agg.* |
| *Festuca rubra* |
| *Galium verum* |
| *Hydrocotyle vulgaris* |
| *Linum catharticum* |
| *Lotus corniculatus* |
| *Orchid spp.* |
| *Plantago lanceolata* |
| *Potentilla anserina* |
| *Prunella vulgaris* |
| *Rhinanthus minor* |
| *Sedum acre* |
| *Thymus polytrichus* |
| *Trifolium repens* |
| *Viola canina* |
| *Viola riviniana* |
| *Viola tricolor* |
|  |
| **1b. Lowest number of positive indicator species in a monitoring stop: At least three species present in each stop** |
| **2. Cover of bryophytes: Always over 1%** |
|  |
| **3. Negative Indicator species: No species present in more than 40% of stops. *L. perenne*** *and P. pratense* **not present in more than 20% of the stops. Combined cover of negative indicators 5% or less** |
| *Arrenatherum elatius* |
| *Cirsium arvense* |
| *Cirsium vulgare* |
| *Senecio jacobaea* |
| *Urtica dioica* |
| ***Lolium perenne*** |
| ***Phleum pratense*** |
| ***Pteridium aquilinum*** |
|  |
| **4. Non-Native species: no species present in more than 20% of the stops** |
|  |
| **5. Flowering and fruiting of positive indicator species: present in more than 40% of stops** |
|  |
| **6. Sward Height: mean height <20cm** |

6210\* Semi-natural grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia (6210); important orchid sites (\*6210)

|  |  |
| --- | --- |
| **High Quality positive Indicator species** | **Positive Indicator Species** |
| *Antennaria dioica* | *Arabis hirsute* |
| *Anthyllis vulneraria* | *Brachypodium pinnatum* |
| *Asperula cynanchica* | *Bromopsis erecta* |
| *Blackstonia perfoliata* | *Carex flacca* |
| *Briza media* | *Ctenidium molluscum* |
| *Campanula rotundifolia* | *Daucus carota* |
| *Carex caryophylla* | *Galium verum* |
| *Carlina vulgaris* | *Helictotrichon pubescens* |
| *Centaurea scabiosa* | *Homalothecium lutescens* |
| *Filipendula vulgaris* | *Leontodon hispidus/saxatilis* |
| *Gentiana verna* | *Lotus corniculatus* |
| *Gentianella amarelle/campestris* | *Origanum vulgare* |
| *Geranium sanguineum* | *Pilosella officinarum* |
| *Knautia arvensis* | *Ranunculus bulbosus* |
| *Koeleria macrantha* | *Sesleria caerulea* |
| *Linum catharticum* | *Thymus polytrichus* |
| *Primula veris* | *Trisetum flavescens* |
| *Sanguisorba minor* |  |
| Orchid species (count individual sp. separately) | **No. of positive indicator species present ≥7** |
| **Number of high quality species present ≥2** |  |
|  |  |
| **Negative Indicator species** | **Forb:graminoid ratio** 40:90% |
| *Arrhenatherum elatius* |  |
| *Cirsium arvense* |  |
| *Cirsium vulgare* | **Litter cover** ≤ 25% |
| *Dactylis glomerata* |  |
| *Lolium perenne* |  |
| *Rumex crispus* | **Cover of bare soil** ≤ 10% |
| *Rumex obtusifolius* |  |
| *Senecio jacobaea* |  |
| *Trifolium repens* |  |
| *Urtica dioica* |  |
| **Neagtive indicator species cover individually ≤ 10%** | |
| **Negative indicator species cover collectively ≤ 20%** | |
|  |  |
| **Cover of scrub, bracken, heath** (woody except, for *Juniperus communis, Rosa spinosissima Dryas octapetala and Helianthemum oelandicum*) ≤ 5% | |
| **Sward height**: Proportion of the sward between 5-40cm tall Area ≥30% | |
| **Area of Habitat showing signs of serious grazing damage or disturbance: ≤20%** | |

# Appendix II. Repeat relevés

|  |  |  |
| --- | --- | --- |
| R9IO 5/8/14 | R97IO 9/8/17 | |
| UNCUT/HEAVY | CUT/HEAVY | |
| Repeat relevé. Vegetation approaching Briza media-Thymus polytrichus |
|  |  |
|  |  |
|  |  |
|  |  |
| Score 4 | Score 5 |
| GL2C Holcus lanatus - Lolium perenne | GL3C Festuca rubra - Plantago lanceolata |
| |  |  |  | | --- | --- | --- | | FAIL | FAIL | FAIL | | |  |  |  | | --- | --- | --- | | FAIL | FAIL | FAIL | |
| GL2C Holcus lanatus - Lolium perenne | GL3C Festuca rubra - Plantago lanceolata |
| |  |  |  | | --- | --- | --- | | FAIL | FAIL | FAIL | | |  |  |  | | --- | --- | --- | | FAIL | FAIL | FAIL | |

|  |  |
| --- | --- |
| R47IO 12/8/15 | R47IO 10/8/17 |
| UNCUT/HEAVY | CUT/HEAVY |
|  |  |
|  |  |
|  |  |
| SCORE 3 | SCORE 4 |
| GL3C Festuca rubra - Plantago lanceolata | GL3C Festuca rubra - Plantago lanceolata |
| |  |  |  | | --- | --- | --- | | PASS | FAIL | PASS | | |  |  |  | | --- | --- | --- | | FAIL | FAIL | FAIL | |

|  |  |
| --- | --- |
| R4IMR 25/8/14 | 3/8/17 |
| UNCUT/heavy | CUT/HEAVY |
| Repeat relevé, first cut jan/feb 2015. Vegetation approaching GL3A Briza media-Thymus polytrichus. Deeper parts of field support scrub vegetation. | |
|  |  |
|  |  |
|  |  |
| Score 4 | Score 3b |
| WL4F Betula pubescens - Pteridium aquilinum | GL3C Festuca rubra - Plantago lanceolata |
| |  |  |  | | --- | --- | --- | | FAIL | FAIL | FAIL | | |  |  |  | | --- | --- | --- | | FAIL | FAIL | FAIL | |
|  |  |

|  |  |
| --- | --- |
| R8IMR 26/8/14 | 2/8/17 |
| UNCUT/LIGHT |  |
|  |  |
|  |  |
|  |  |
| Score 4 | Score 5 |
| GL3C  Festuca rubra - Plantago lanceolata | GL3C  Festuca rubra - Plantago lanceolata |
| |  |  |  | | --- | --- | --- | | PASS | FAIL | FAIL | | |  |  |  | | --- | --- | --- | | PASS | FAIL | PASS | |

|  |  |
| --- | --- |
| R23IMR 14/5/15 | R23IMRR 8/6/17 |
| CUT/LIGHT |  |
|  |  |
|  |  |
|  |  |
| SCORE 3 | SCORE 3B |
| GL3A Briza media - Thymus polytrichus | GL3A Briza media - Thymus polytrichus |
| |  |  |  | | --- | --- | --- | | PASS | PASS | PASS | | |  |  |  | | --- | --- | --- | | PASS | PASS | PASS | |

|  |  |
| --- | --- |
| R70IMR 6/7/16 | 12/7/17 |
| CUT/MEDIUM |  |
|  |  |
|  |  |
|  |  |
| SCORE 4 | SCORE 5 |
| GL3C Festuca rubra - Plantago lanceolata | GL3C Festuca rubra - Plantago lanceolata |
| |  |  |  | | --- | --- | --- | | PASS | FAIL | PASS | | |  |  |  | | --- | --- | --- | | PASS | FAIL | PASS | |

|  |  |
| --- | --- |
| R74IMR | R74IMRR |
| CUT/LIGHT Garlon test | Repeat cuts + garlon on scrub regrowth |
| Repeated cutting and garlon. Positive indicator species increase and pass criteria for pos ind sp. | |
|  |  |
|  |  |
|  |  |
| SCORE 4 | SCORE 5 |
| GL3C Festuca rubra - Plantago lanceolata | GL3C Festuca rubra - Plantago lanceolata |
| |  |  |  | | --- | --- | --- | | PASS | FAIL | PASS | | |  |  |  | | --- | --- | --- | | PASS | PASS | PASS | |

|  |  |
| --- | --- |
| R76IMR 12/7/16 | 13/7/17 |
| CUT/LIGHT | CUT/LIGHT |
|  |  |
|  |  |
|  |  |
| SCORE 4 | SCORE 4 |
| GL3C Festuca rubra - Plantago lanceolata | GL3F Festuca rubra - Lotus corniculatus |
| |  |  |  | | --- | --- | --- | | FAIL | FAIL | PASS | | |  |  |  | | --- | --- | --- | | PASS | FAIL | PASS | |

|  |  |  |
| --- | --- | --- |
| R77IMR 12/7/16 | | 13/7/17 |
| CUT/LIGHT | | |
|  |  | |
|  |  | |
|  |  | |
| SCORE3 | SCORE 4 | |
| GL3C Festuca rubra - Plantago lanceolata | GL3C Festuca rubra - Plantago lanceolata | |
| |  |  |  | | --- | --- | --- | | FAIL | FAIL | FAIL | | |  |  |  | | --- | --- | --- | | PASS | PASS | PASS | | |

|  |  |
| --- | --- |
| R78IMR 12/7/16 | 13/7/17 |
| CUT/LIGHT | |
|  |  |
|  |  |
|  |  |
| SCORE 3 | SCORE 4 |
| GL3A Briza media - Thymus polytrichus | GL3C Festuca rubra - Plantago lanceolata |
| |  |  |  | | --- | --- | --- | | PASS | PASS | PASS | | |  |  |  | | --- | --- | --- | | PASS | FAIL | PASS | |

|  |  |
| --- | --- |
| R80IMR 12/7/16 | 1/8/17 |
| CUT/HEAVY |  |
|  |  |
|  |  |
|  |  |
| Score 4 | SCORE 5 |
| GL3A Briza media - Thymus polytrichus | GL3C Festuca rubra - Plantago lanceolata |
| |  |  |  | | --- | --- | --- | | PASS | FAIL | FAIL | | |  |  |  | | --- | --- | --- | | FAIL | FAIL | FAIL | |

|  |  |
| --- | --- |
| R82IMR 12/7/16 | 1/8/17 |
| CUT/HEAVY |  |
|  |  |
|  |  |
|  |  |
| SCORE 4 | Score 5 |
| WL2 Corylus avellana - Potentilla sterilis | WL2 Corylus avellana - Potentilla sterilis |
| |  |  |  | | --- | --- | --- | | FAIL | FAIL | FAIL | | |  |  |  | | --- | --- | --- | | FAIL | FAIL | FAIL | |

|  |  |
| --- | --- |
| R83IMR 13/7/16 | 1/8/17 |
| UNCUT/MED |  |
|  |  |
|  |  |
|  |  |
| SCORE 4 | SCORE 4 |
| GL3C Festuca rubra - Plantago lanceolata | GL3F Festuca rubra - Lotus corniculatus |
| |  |  |  | | --- | --- | --- | | PASS | FAIL | PASS | | |  |  |  | | --- | --- | --- | | PASS | FAIL | PASS | |

|  |  |
| --- | --- |
| R86IMR 13/7/16 | 1/8/17 |
| UNCUT/MEDIUM |  |
|  |  |
|  |  |
|  |  |
| SCORE 4 | SCORE 4 |
| GL3C Festuca rubra - Plantago lanceolata | NONE |
| |  |  |  | | --- | --- | --- | | PASS | FAIL | FAIL | | |  |  |  | | --- | --- | --- | | PASS | FAIL | FAIL | |

|  |  |
| --- | --- |
| R89IMR 21/7/16 | 2/8/17 |
| CUT/LIGHT |  |
|  |  |
|  |  |
|  |  |
| SCORE 4 | SCORE 5 |
| GL2C Holcus lanatus - Lolium perenne | GL3C Festuca rubra - Plantago lanceolata |
| |  |  |  | | --- | --- | --- | | FAIL | FAIL | FAIL | | |  |  |  | | --- | --- | --- | | FAIL | FAIL | FAIL | |

|  |  |
| --- | --- |
| R45IMN 18/8/15 Molinia issue | 23/8/17 grazed july 2017 |
|  |  |
|  |  |
|  |  |
| SCORE 4 | SCORE 4 |
| GL1D Molinia caerulea - Potentilla erecta - Agrostis stolonifera | HE4D Molinia caerulea - Potentilla erecta - Erica tetralix |
| |  |  |  | | --- | --- | --- | | FAIL | FAIL | FAIL | | |  |  |  | | --- | --- | --- | | PASS | FAIL | PASS | |

# Appendix III. Transect data: Bracken and scrub (stem counts and % cover)

**-Bracken**

**Bracken and Briars**