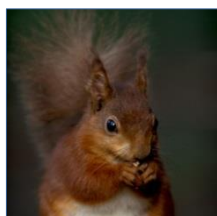


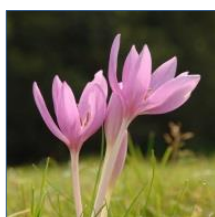
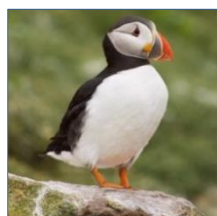
NATIONAL PARKS AND WILDLIFE SERVICE



THE MONITORING AND ASSESSMENT OF THREE EU HABITATS DIRECTIVE ANNEX I GRASSLAND HABITATS



James R. Martin, Fionnuala H. O'Neill and
Orla H. Daly



An Roinn Cultúir,
Oidhreacht agus Gaeltachta
Department of Culture,
Heritage and the Gaeltacht

Front cover, small photographs from top row:

Coastal heath, Howth Head, Co. Dublin, Maurice Eakin; **Red Squirrel** *Sciurus vulgaris*, Eddie Dunne, NPWS Image Library; **Marsh Fritillary** *Euphydryas aurinia*, Brian Nelson; **Puffin** *Fratercula arctica*, Mike Brown, NPWS Image Library; **Long Range and Upper Lake**, Killarney National Park, NPWS Image Library; **Limestone pavement**, Bricklieve Mountains, Co. Sligo, Andy Bleasdale; **Meadow Saffron** *Colchicum autumnale*, Lorcan Scott; **Barn Owl** *Tyto alba*, Mike Brown, NPWS Image Library; **A deep water fly trap anemone** *Phelliactis* sp., Yvonne Leahy; **Violet Crystalwort** *Riccia huebeneriana*, Robert Thompson

Main photograph: ***6210 grassland** at Leagh South Co. Galway (site 2271), Orla Daly



The monitoring and assessment of three EU Habitats Directive Annex I grassland habitats

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Executive Summary

This report presents details of a monitoring survey conducted between 2015 and 2017 to assess the conservation status of three EU Annex I grassland habitats: Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (6210) important orchid sites (*6210), *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) (6410), and Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*) (6510).

During the Grassland Monitoring Survey (GMS) a review was carried out of the methodology used during the baseline Irish Semi-natural Grasslands Survey (ISGS) of O'Neill *et al.* (2013). Amendments to the survey and assessment methodology are outlined in the report and these updated methods were followed during the GMS.

A total of 110 sites were monitored by the GMS. The target Annex I habitat for 55 sites was 6210/*6210, for 33 sites it was the 6410 habitat, and for 22 sites it was 6510. During the GMS 237.83ha of 6210/*6210 habitat were surveyed, representing 17% of the 1,416ha of 6210/*6210 habitat that is currently mapped within the State. For the 6410 habitat 167.87ha were surveyed, representing 29% of the 586ha of 6410 habitat that is currently mapped within the State. For the 6510 habitat 60.64ha were surveyed, representing 39% of the 157ha of 6510 habitat that is currently mapped within the State.

The data collected during the GMS contributed to the national conservation assessment for all three target Annex I grassland habitats. For the 6210/*6210 habitat the overall conservation assessment was Unfavourable-Bad. Within this assessment the *Area* parameter was Unfavourable-Bad with a decreasing trend and the *Structure & functions* parameter was Unfavourable-Inadequate with a stable trend. The data collected during the GMS indicated that habitat loss is the largest threat to the 6210/*6210 habitat, with 31% of the surveyed area of 6210/*6210 reported lost during the GMS due to pressures such as agricultural intensification. For the 6410 habitat the overall conservation assessment was Unfavourable-Bad. Within this assessment the *Area* parameter was Unfavourable-Bad with a decreasing trend and the *Structure & functions* parameter was Unfavourable-Bad with a stable trend. The data collected during the GMS indicate that habitat degradation, through pressures such as abandonment, agricultural intensification, and forestry, is the biggest threat to the conservation of the 6410 habitat. For the 6510 habitat the overall conservation assessment was also Unfavourable-Bad. Within this assessment both the *Area* and *Structure & functions* parameters were Unfavourable-Bad with a decreasing trend. The data collected during the GMS indicated that the 6510 habitat is the most threatened of the three Annex I grassland habitats studied, with 28% of the surveyed area of 6510 reported lost and a significant decline in the number of sites with Favourable *Structure & functions*: only three sites were reported to have Favourable *Structure & functions* during the GMS, whereas eight of the same 18 sites were reported to have Favourable *Structure & functions* during the baseline ISGS. Pressures such as agricultural intensification and the application of natural fertilisers, such as slurry, are the largest threats to the conservation of the 6510 habitat.

Within the report's discussion, recommendations have been made to help address the declining conservation status of all three Annex I grassland habitats. Recommendations are also made for changing the sampling strategy used to select Annex I grassland sites for monitoring, to ensure that Annex I grassland data that are collected in the future more accurately reflect the national status of the habitats.

Acknowledgements

We are grateful to everyone who contributed to the planning and completion of this project.

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We thank Deirdre Lynn for her project support and for helpful comments on the drafts of this report, and all the other NPWS staff, including field staff, who helped us in various ways throughout the project. The assistance of Rory Hodd for the identification of problematic bryophyte samples and helping to survey some of the sites is also gratefully acknowledged.

We would also like to thank Amanda Browne and the AranLIFE project, Sharon Parr from the Burren Programme, and Dolores Byrne from the Results-based Agri-environment Pilot Scheme for the information and help that they provided.

Special thanks to all BEC staff members who helped us in a multitude of ways with other aspects of the project.

Finally, we thank the farmers and landowners for giving us permission to survey their land and for the background information they provided.

1. Introduction

1.1. EU Annex I grassland habitats in Ireland

Annex I habitats are habitats of European importance which are listed under Annex I of the EU Habitats Directive (92/43/EEC). Under Article 17 of the Habitats Directive, all EU Member States that are signatories of the Directive have a legal obligation to report on the conservation status of the Annex I habitats that occur within their boundaries. These national conservation status assessment reports are produced every six years. The next round of reporting, covering the period 2013-2018, is due in 2019. This is the third round of reporting carried out under Article 17 where the conservation status is assessed. The outputs of this project will feed into Ireland's 2019 Article 17 report.

The three Annex I grassland habitats which are being reported on for this project are:

- Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (6210); important orchid sites (*6210)
- *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) (6410)
- Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*) (6510)

Of these three Annex I grassland habitats only the orchid-rich variant of 6210 (*6210) is accorded priority status (i.e., habitats in danger of disappearance and whose natural Range falls within the territory of the European Union).

The National Parks and Wildlife Service (NPWS) of the Department of Culture, Heritage and the Gaeltacht commissioned BEC Consultants Ltd to carry out the Grassland Monitoring Survey (GMS), a three-year survey conducted from 2015 to 2017 to monitor and assess these three primarily lowland Annex I grassland habitats. The three Annex I grassland habitats, 6210/*6210, 6410 and 6510, are hereafter often referred to as the target Annex I grassland habitats.

The following descriptions are all adapted from the National Conservation Status Assessments of NPWS (2013).

Within Ireland the Annex I habitat 6210/*6210 comprises species-rich plant communities found on shallow, well-drained calcareous substrates. It is considered a priority habitat only if it is an important orchid site. The Annex I habitat includes a mixture of grasses and herbs, with calcicole species typically frequent. It usually occurs on obvious geological features such as eskers, outcropping limestone rock and in association with limestone pavement. The Burren and Aran Islands (Cos Clare/Galway) and Dartry Mountains (Cos Sligo/Leitrim) are particularly important areas within Ireland for this Annex I habitat. The 6210/*6210 habitat is comprised of a species-diverse group of plant communities belonging to the Bromion-erecti, including GL3A *Briza media* – *Thymus polytrichus* grassland (Perrin 2018a) and NVC communities CG1/CG2 (Rodwell 1992).

The 6410 habitat is represented within Ireland by both fen and grassland communities on nutrient-poor soils. Sites with this habitat are either managed as traditional hay meadows (cut only once a year in late summer or autumn with the hay crop removed) or more usually as extensive pasture. Within Ireland 6410 habitat occurs in lowland plains on neutral to calcareous gleys, sometimes with a marl layer beneath the surface, or on peaty soils both in lowland and upland situations. It generally has a

central to north-western distribution in Ireland that follows the distribution of *Cirsium dissectum*, one of the key indicator species for the habitat. The Annex I habitat is very rare in the east of the country, with only one site, Glenasmole Valley SAC (site code 001209) in Co. Dublin, recorded within the five eastern counties that border the Irish Sea. The 6410 habitat is comprised of a few distinct communities belonging to the Junco-Molinion. These communities can be classified within the GL1C *Molinia caerulea* – *Succisa pratensis* grassland (Perrin 2018b), the *Carex panicea* – *Festuca rubra* community (Heery 1991) and M24 *Molinia caerulea* – *Cirsium dissectum* fen meadow (Rodwell 1991).

Irish examples of the Annex I habitat 6510 are mesotrophic semi-natural grasslands that are managed as traditional hay meadows. These meadows are synonymous with the fertile plains of the larger river systems such as the Shannon. However, they have been found on flatter ground amongst low hills and drumlins, and there are a limited number of coastal sites. The geographical distribution of this habitat has reduced over the last 50 years due to a decline in the use of traditional hay meadows in farming systems. The 6510 habitat is comprised of a few distinct meadow communities belonging to the Arrhenatherion. These communities can be classified within the GL3E *Festuca rubra* – *Rhinanthus minor* community (Perrin 2018c), *Lathyrus pratensis* community (Heery 1991) and NVC communities MG4/MG5 (Rodwell 1992).

1.2 Assessment of Annex I habitats

Annex I habitats are assessed under four parameters of conservation status: *Range*, *Area*, *Structure & functions*, and *Future prospects*. Guidance on assessment is provided by the EU (DG Environment 2017). Evaluation of conservation status requires the separate assessment of the four parameters. Each parameter can receive an assessment of Favourable (green), Unfavourable-Inadequate (amber) or Unfavourable-Bad (red). The individual parameter assessments are then combined, with the aid of an evaluation matrix (Table 1), to give an overall national assessment of conservation status for the habitat.

This survey assessed three parameters at each GMS site: *Area*, *Structure & functions*, and *Future prospects*. *Range* was assessed separately at the national scale for the National Conservation Assessment report.

Area is assessed by examining the current extent of the habitat and comparing it with that mapped in previous surveys, or by comparing areas across different series of aerial photographs and satellite imagery. Area losses are expressed as percentage loss on an annual basis over a specified period.

To assess the *Structure & functions* of the target Annex I grassland habitats at the sites, the survey methodology follows what has now become standard practice in Ireland in using monitoring stops (or plots). *Structure & functions* are assessed by means of several criteria (devised by each Member State to assess the habitat according to local conditions) that examine key attributes of the habitat and compare the current values with set benchmarks or thresholds that reflect the habitat when it is in favourable condition. The criteria are examined and assessed at a monitoring stop, which is usually a plot of fixed size delimited on the ground using a measuring tape or quadrat square. The dimensions of the plot and the number of monitoring stops recorded vary depending on the type and extent of the habitat.

Table 1 General evaluation matrix for assessment of Conservation Status (CS) (adapted from DG Environment 2016).

| Parameter | Conservation Status | | | |
|----------------------------------|--|-------------------------------------|---|--|
| | Favourable ('green') | Unfavourable – Inadequate ('amber') | Unfavourable - Bad ('red') | Unknown |
| <i>Range</i> | Stable or increasing AND not smaller than the 'favourable reference Range' | Any other combination | >1% decline in Range per year over specified period OR More than 10% below 'favourable reference Range' | No or insufficient reliable information available |
| <i>Area</i> | Stable or increasing AND not smaller than the 'favourable reference area' AND without significant changes in distribution pattern within Range (if data available) | Any other combination | >1% decline in area per year over specified period OR With major losses in distribution pattern within Range OR More than 10% below 'favourable reference area' | No or insufficient reliable information available |
| <i>Structure & functions</i> | <i>Structure & functions</i> in good condition and no significant deteriorations / pressures | Any other combination | > 25% of the area is unfavourable as regards its specific structures and functions | No or insufficient reliable information available |
| <i>Future prospects</i> | The habitat's prospects for its future are excellent / good, no significant impact from threats expected; long-term viability assured | Any other combination | The habitat's prospects are bad, severe impact from threats expected; long-term viability not assured. | No or insufficient reliable information available |
| Overall assessment of CS | All 'green' OR three 'green' and one 'unknown' | One or more 'amber' but no 'red' | One or more 'red' | Two or more 'unknown' combined with green or all 'unknown' |

The *Future prospects* assessment at each site requires an examination of the habitat's stability, in terms of its Area and *Structure & functions*, in the context of the impacts and activities taking place in the Annex I grassland across the site. The balance between positive and negative impacts is weighed up and the *Future prospects* of the habitat at the site over the next two reporting periods (12 years) are evaluated.

1.3 Monitoring of the three target Annex I grassland habitats

The monitoring and assessment of the three target Annex I grassland habitats located within Ireland started in 2006, with the survey of 33 orchid-rich calcareous grassland sites (*6210) (Dwyer *et al.* 2007). Subsequently, Annex I grassland monitoring was an integral part of the baseline Irish Semi-natural Grasslands Survey (ISGS) 2007-2012. The monitoring results from the baseline ISGS were reported by region in Martin *et al.* (2007, 2008, 2013), O'Neill *et al.* (2009, 2010) and Devaney *et al.* (2013), with a final national report utilising the data from all 1,192 grassland sites published as an Irish Wildlife Manual (O'Neill *et al.* 2013). The methodology developed during the ISGS was applied to a survey of 25 orchid-rich calcareous grassland sites (*6210) in 2014 (Curtis and Wilson 2014) and a survey of the 6210/*6210 habitat is currently being undertaken as part of the AranLife project (Browne in prep.).

NPWS have published *The Status of EU Protected Habitats and Species in Ireland* (NPWS 2013) and this lists the overall conservation status for each of the three target Annex I grassland habitats, including an assessment of the *Range* parameter at a national level.

1.4 Main project aims

1. Utilise the field survey methodologies outlined in O'Neill *et al.* (2013) to survey 100 Annex I grassland sites.
2. Refine assessment methodologies with consideration given to deriving locally relevant targets.
3. Write an Irish Wildlife Manual for the project and compile updated conservation status assessments and site-based monitoring assessments in separate volumes.
4. Update the ISGS Access database with all data.
5. Complete a National Conservation Status Assessment and audit trail for each of the three target Annex I habitats.

2 Methodology

2.1 Site selection

The aim of the GMS was to survey 100 sites, so 110 sites were selected (Table 2) to allow for issues such as access difficulties. The GMS sites were selected from the 1,192 grassland sites mapped during the baseline ISGS 2007-12, based on the recommendations detailed in Appendix 2 of O'Neill *et al.* (2013). These recommendations proposed that monitoring should focus on “primary areas” of Annex I grassland, those representing the best examples of each habitat. Site selection also took into account any significant gaps identified in the natural Range of these primary areas of Annex I grassland for each target habitat when compared with the data presented in NPWS (2013). The GMS retained the site names and site numbers used during the baseline ISGS 2007-12 and all data were added to an updated version of the ISGS 2007-12 Access database.

Care was taken to ensure that, wherever possible, GMS sites did not include multiple polygons of the target Annex I grassland habitat that were widely separated (>250-500 m depending on local topography), or owned/managed by separate landowners. This approach allowed each GMS site to be treated as one management unit.

For sites that were recorded by the ISGS baseline survey as containing a target Annex I grassland habitat, but which during the GMS were found to contain only non-Annex semi-natural or semi-improved grassland, often due to changes in management, monitoring plots were still recorded. Also, if through natural succession to scrub or heath a grassland site had changed to a non-grassland habitat it was still included within the GMS. However, if a site had been more intensively managed and was now improved agricultural grassland or amenity grassland, or a non-grassland habitat such as forestry, the site was rejected and not surveyed. The reason for these decisions were that semi-natural grasslands, semi-improved grasslands or non-grassland habitats that came about by natural succession may, through sensitive management, return to the target Annex I grassland habitat; whereas with intensively modified sites, such as improved agricultural grassland or commercial forestry, this scenario would be unlikely.

The number of GMS survey sites (Table 2) reflected the relative abundance of the three target Annex I grasslands.

Table 2 Number of GMS Annex I grassland sites.

| Annex I grassland | No. of GMS monitoring sites |
|-------------------|-----------------------------|
| 6210/*6210 | 55 |
| 6410 | 33 |
| 6510 | 22 |
| Total | 110 |

For the habitat 6210/*6210, the 55 monitoring sites were split as evenly as possible between the two variants. GMS sites were not selected from the Aran Islands or Special Areas of Conservation (SACs) within the Dartry Mountains in Cos Sligo and Leitrim as these are covered by AranLIFE and the NPWS National Survey of Upland Habitats respectively. Also due to the fact that the Burren

Programme already collects data on Annex I grassland habitats within the Burren this region was under-sampled during the GMS to prevent duplication of survey effort. Figure 1 shows the locations of the 6210/*6210 monitoring sites superimposed on the national 10km distribution map for the habitat (NPWS 2013).

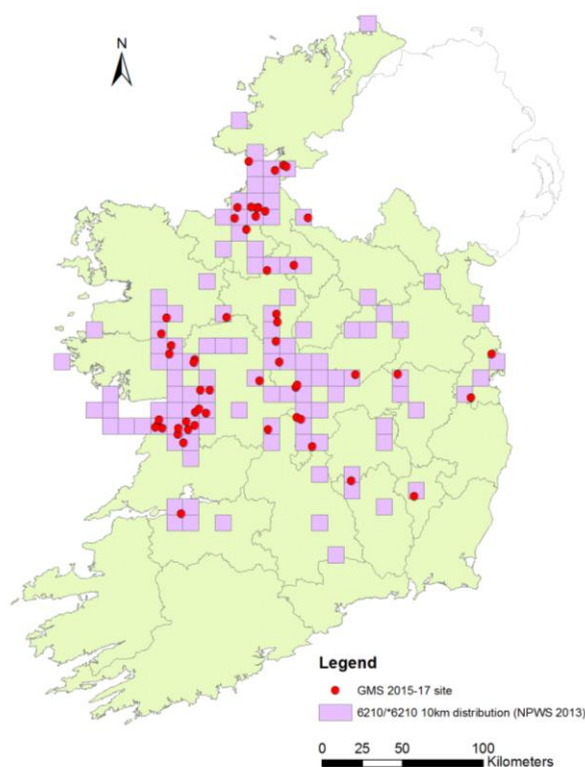


Figure 1 Location of the 55 monitoring sites for the 6210/*6210 habitat (some overlapping points could not be shown) overlaid on to the national 10km distribution map (NPWS 2013) for the habitat.

For the Annex I habitat 6410, the 33 monitoring sites were selected from across its ecological range, with both grassland and fen examples represented. Figure 2 shows the locations of the 6410 monitoring sites superimposed on the national 10km distribution map for the habitat (NPWS 2013). For the 6510 habitat, the 22 sites were selected from across the habitat's range. Due to the importance of the rare plant species *Sanguisorba officinalis* as a characteristic species for this habitat, any 6510 site where this species was recorded was selected for monitoring. Figure 3 shows the locations of the 6510 monitoring sites superimposed on the national 10km distribution map for the habitat (NPWS 2013). As stated above, for all three target Annex I grassland habitats the GMS sites were selected based primarily on the recommendations detailed in Appendix 2 of O'Neill *et al.* (2013). This approach possibly resulted in a greater number of GMS sites being selected from regions where large areas of each of the target Annex I grassland habitats occur, such as the Shannon Callows for the 6510 habitat, than would have been the case if the GMS sites had been randomly selected from all sites where the target Annex I grassland habitats have been recorded.

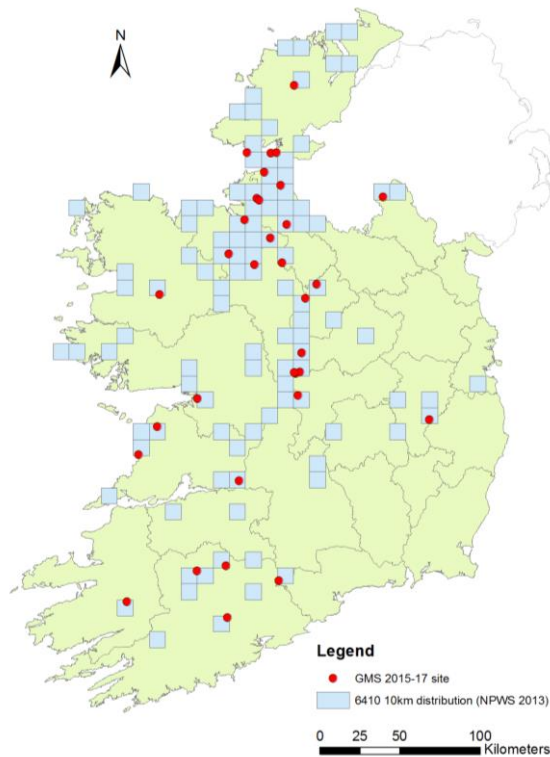


Figure 2 Location of the 33 monitoring sites for the 6410 habitat (some overlapping points could not be shown) overlaid on to the national 10km distribution map (NPWS 2013) for the habitat.

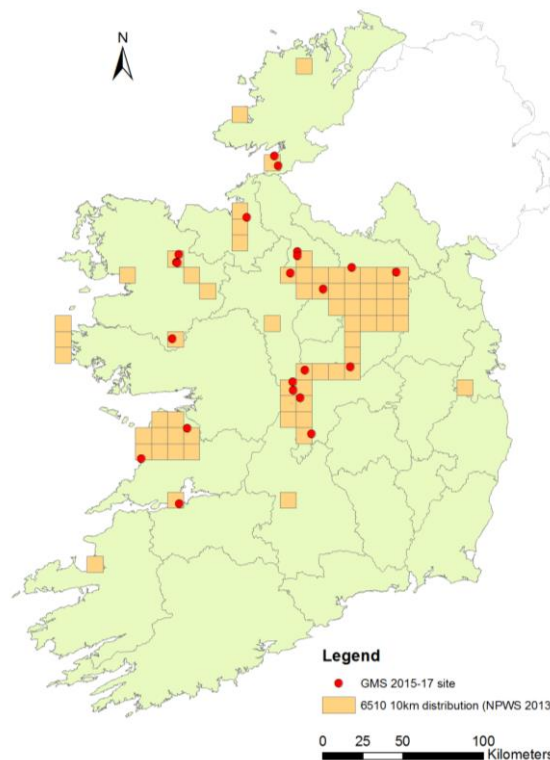


Figure 3 Location of the 22 monitoring sites for the 6510 habitat (some overlapping points could not be shown) overlaid on to the national 10km distribution map (NPWS 2013) for the habitat.

2.2 Field survey

A site pack was set up for each site, containing the ISGS baseline site report and a field map consisting of an aerial photograph of the site and showing the location of all ISGS plots. Land Registry (www.landdirect.ie) was checked for ownership information beforehand and ownership details were included in the site pack if they were available. A blank site summary data sheet was also included in the pack, to be completed by the ecologists at the end of each site survey.

NPWS Rangers were contacted in advance of the survey. Permission from landowners was sought on privately owned land.

Trimble Nomad 900 Series handheld computers were set up to record GPS waypoints in ArcPad and to record monitoring stop and vegetation data in Turboveg CE (Alterra, The Netherlands). The shapefiles created during the baseline ISGS survey were uploaded onto the Trimbles to enable the surveyors to navigate directly to site polygons and monitoring stops.

2.3 Assessment parameters

2.3.1 Area assessment

The *Area* parameter was assessed in the field, taking note of any recent losses in the target Annex I grassland habitats evident during the survey. As the ISGS baseline data were available for all monitoring sites, the *Area* parameter was generally assessed by comparing the area of the target Annex I grassland habitat mapped by the ISGS baseline with the area mapped during the GMS. After the site visit Google Earth® time-series images were also consulted for a number of sites to determine if area losses due, for example, to construction of housing or other structures had taken place since the baseline survey. The area loss was calculated as a percentage of the original (pre-loss) area as follows:

$$(\text{Current area} / (\text{Current area} + \text{area lost})) \times 100$$

This was then divided by the number of years since the site was surveyed in the baseline survey to derive the annual percentage loss in area.

Where practical, all area changes were mapped in the field, with the target Annex I grasslands assigned to single habitat polygons where they constituted 100% of the cover. In some circumstances, such as upland sites, the target Annex I grasslands were mapped as a mosaic with other habitats. When this was the case the target Annex I grassland and each other habitat within the mosaic was assigned a percentage cover.

When a change in area was mapped it was assigned to either 'change in interpretation' (e.g. refinement in the mapping due to improved knowledge of the habitat, or more accurate remote imagery), 'ecological change' (e.g. succession from grassland to heath) or 'anthropogenic change' (e.g. change from semi-natural to improved agricultural grassland due to intensification). The activity thought to have brought about the area change was recorded following the list of activity codes in Ssymank (2011). In addition to mapping the changes in area for the target Annex I grassland the reasons for the change were recorded using the site summary data sheet (Appendix 1).

Additional areas of Annex I grassland habitat outside the polygons being monitored were noted, but it was not always possible within the resources available to survey these additional polygons in detail. Although these additional areas were not always monitored their location was recorded and they contributed to the area data for the National Conservation Assessments (NCA) for each of the target Annex I grassland habitats. As well as the GMS, other data sources such as Roche (2013), Daly and Barron (2014), O'Neill and Martin (2015), Daly (2016), Galway County Council (2017), Martin and Brophy (2017), Perrin (2018a-b), and the AranLIFE project (Browne, in prep.), were also used to update the NCA area data for each of the target Annex I grassland habitats.

2.3.2 *Structure & functions assessment*

The *Structure & functions* parameter was assessed according to the methodology described and implemented by O'Neill *et al.* (2013) and the Annex I grassland assessment criteria listed in Appendix 1.

For all GMS sites the plots recorded by the ISGS baseline survey (O'Neill *et al.* 2013) were revisited for the target Annex I grassland habitat for which the site was being monitored. The plots were relocated using a Trimble Nomad handheld mapping unit with the ISGS plot and habitat shapefiles loaded onto them. If, when a fieldworker went to a monitoring plot location, the Annex I habitat could not be located, or the point was subject to localised damage, if possible they repositioned the plot to the nearest area of the target Annex I grassland habitat. If the target Annex I grassland could not be located at the site, monitoring plots were still recorded if semi-natural grassland or heath/scrub habitats now existed where the target Annex I grassland was formerly recorded. If plots were repositioned, or additional plots were required to fulfil the plot-to-area guidelines presented in O'Neill *et al.* (2013), the new plots were numbered from 30 onwards, as no site had more than 29 plots recorded during the ISGS baseline survey. If plots were recorded at the exact same location during the GMS as the ISGS baseline survey, the same plot number was used, with the year of survey used to distinguish the two.

In recognition of the fact that high-quality positive indicator species can sometimes only be occasional within an Annex I grassland community, a new protocol was applied during the GMS of allowing monitoring stops to pass if a high-quality positive indicator species, such as *Cirsium dissectum*, was recorded within 20m of the monitoring plot. Also, in the case of monitoring plots that were only one positive indicator short of passing the assessment, a monitoring stop could be allowed to pass if an additional positive indicator species was recorded within 20m of the plot.

Modifications to the assessment criteria applied by O'Neill *et al.* (2013) were utilised for the 6510 habitat, with a marginal failure (35-39%) in % forb:graminoid ratio allowed to pass on expert judgement. Based on a review of JNCC (2004) and O'Neill *et al.* (2013), who proposed that a lower threshold may be more appropriate for 6410, the % forb:graminoid ratio allowed to pass on expert judgement was extended to $\geq 30\%$ for 6210/*6210 and 6410.

It was noted during the GMS that there were 6410 sites where no *Molinia caerulea* was recorded within any of the monitoring plots. As *M. caerulea* is an important component of the 6410 habitat the monitoring methodology was modified to ensure the frequency of this species at each site is recorded (Appendix 1).

The grassland monitoring undertaken during 2015 and 2016 demonstrated that it was not possible to complete the fieldwork component of the project within the one person-day allocated to each site, with the experienced field team only able to complete 0.65 sites per person-day. To increase the survey rate for monitoring plots during 2017, instead of recording full relevés only the data required for the *Structure & functions* assessment criteria within each plot (e.g. the number of positive indicator species or the cover of negative indicator species listed in Appendix 1) were recorded. Only when new baseline plots were established (e.g. if a plot was repositioned) were the full dataset listed by O'Neill *et al.* (2013), such as accurate cover scores for all plant species including bryophytes, recorded. For the 2017 monitoring plots where only the *Structure & functions* assessment criteria were recorded, an on-site decision was made on the possible inclusion of local assessment criteria, such as an additional positive indicator species.

Once the fieldwork was completed the *Structure & functions* assessment criteria were analysed and a decision was taken on whether to apply expert judgement to pass monitoring plots that marginally failed the assessment (e.g. all but one assessment criterion passed and the failed criterion was not considered to be critical). For each site, the number of plots that passed the *Structure & functions* assessment was expressed as a percentage of all plots recorded within the target Annex I habitat at the site. If 100% of the monitoring plots passed the assessment then the Annex I habitat was recorded as having Favourable *Structure & functions*. If >25% of the monitoring plots at a site failed the assessment then the Annex I habitat was recorded as having Unfavourable-Bad *Structure & functions*, as this represented that >25% of the area was in unfavourable condition (Table 1). Any other combinations were recorded as having Unfavourable-Inadequate *Structure & functions*.

2.3.2.1. Local assessment criteria

It was noted in O'Neill *et al.* (2013) that it is important to refine assessment methodologies where appropriate and especially to derive locally relevant targets. The *Structure & functions* criteria listed in Appendix 1 were established based on a national dataset to provide guidance for ecologists on the recognition and assessment of the target Annex I grassland habitats in Ireland. However, during the monitoring of these sites, these criteria were reconsidered on a site-by-site basis and modified to ensure that they were relevant to assess the *Structure & functions* of the Annex I communities that were present. Therefore, the national criteria listed in Appendix 1 formed the basis for any assessment, but for each site, indicator species or criteria such as sward height could be modified slightly if judged to be more appropriate for the site.

2.3.3 Future prospects assessment

EU guidance states that the habitat's *Future prospects* parameter "should be evaluated by individually assessing the expected future trends and subsequently Future prospects of each of the other three parameters [*Range*, *Area*, and *Structure & functions*], taking primarily into account the current conservation status of the parameter, threats (related to the parameter assessed) and the conservation measures being taken or planned for the future. Once the Future prospects of each of the other three parameters have been evaluated, they should be combined to give the overall assessment of Future prospects" (DG Environment 2017).

Future prospects were assessed at the site level by evaluating the *Future prospects* and future expected trend of *Area* and *Structure & functions* at each site, and examining the current pressures, future threats

and beneficial management practices operating on the habitat. Guidance provided by the EU (DG Environment 2017) was followed to determine the future trends and *Future prospects* of each parameter. For the three target Annex I grassland habitats to be assessed as having Favourable *Future prospects*, their prospects had to be judged to be good, with no severe impacts expected from threats and the habitat expected to be stable or improving in the long term. For it to be assessed with Unfavourable-Bad *Future prospects*, its prospects were judged to be bad, with severe impacts expected from threats and the habitat expected to decline or disappear in the long term. An assessment of Unfavourable-Inadequate *Future prospects* was between these two extremes.

To help evaluate *Future prospects* according to the above guidance, the pressures, threats and positive activities occurring on each site were recorded according to the impact codes of Ssymank (2011) (the 2017 impact codes were not available at the commencement of the project). The magnitude of the impact (high, medium or low), influence (positive, negative or neutral) and percentage area of habitat affected were also noted.

Semi-natural grasslands are defined by their management, and as such, small changes to the management regime can have a significant impact on the *Structure & functions* of an Annex I grassland. Therefore in addition to recording the impacts (Ssymank 2011) at each site, two additional database fields were recorded at each site on the site summary data sheet. One field was for additional notes regarding the condition of the target Annex I grassland, and the second field was for comments on the management, including whether the current management regime should be continued or, if it needed to be changed, what the recommended changes are. The data collected in all fields of the site summary data sheet were added to the ISGS Access database and can be viewed by selecting a 'Monitoring report'.

2.3.4 Overall conservation assessment

The conservation condition assessment for the Annex I grassland habitat at each site was evaluated based on the results of all three parameters, according to the evaluation matrix in Table 1 and using the guidance provided by the EU (DG Environment 2017). The criteria for all three parameters were combined for each of the three Annex I grassland habitats and an overall conservation status is presented.

2.4 Digital files accompanying this report

An ArcGIS shapefile was created based on the ISGS 2007-2012 ArcGIS habitat shapefile with areas of the target Annex I habitats remapped where necessary to reflect significant changes in area.

The Annex I grassland monitoring data collected during 2015-2017 have been entered into the Microsoft Access ISGS database. The ISGS database was modified to allow the additional monitoring data to be stored and for monitoring reports to be generated.

This Irish Wildlife Manual is accompanied by several digital files, as follows:

- Two ESRI-compatible shapefiles in ITM projection of mapped habitat polygons and monitoring stops.
- Updated MS-Access ISGS database.

- Turboveg database containing both header and species data for all plots recorded during this survey.
- Photographs (*.jpg) of all plots recorded during the survey plus additional images of notable species and the surrounding landscape and an Image databank (Microsoft® (MS) Excel spreadsheet) listing the photographs taken during the survey.
- Completed NPWS Resource catalogue.

3 Results

3.1 Sites surveyed during the monitoring

A total of 110 sites were visited between 2015 and 2017 for the GMS. The sites are listed in Table 3 by site number, which is the same number used by the baseline ISGS (O'Neill *et al.* 2013). There was active landowner engagement during the project resulting in summary information being sent to 39 land owners, including the three Co. Clare sites owned by NPWS.

Table 3 The 110 GMS sites visited in 2015-17. Each recorded plot was used as a monitoring stop for recording *Structure & functions* criteria. The NPWS conservation site is listed if it overlaps with the GMS area.

| GMS site | County | Target Annex I habitat | NPWS site no. | No. plots | Notes |
|----------|-----------|------------------------|---------------|-----------|--|
| 1 | Offaly | *6210 | SAC 000566 | 4 | Full survey |
| 3 | Offaly | *6210 | SAC 000919 | 4 | Full survey |
| 8 | Offaly | *6210 | pNHA 900 | 4 | Full survey |
| 16 | Offaly | 6210 | pNHA 910 | 0 | Unable to arrange access to the site |
| 82 | Offaly | 6510 | - | 4 | Full survey |
| 107 | Offaly | 6410 | SAC 000216 | 12 | Full survey |
| 108 | Offaly | 6510 | SAC 000216 | 0 | Unable to arrange access to the site |
| 109 | Offaly | 6410 | SAC 000216 | 8 | Full survey |
| 109 | Offaly | 6510 | SAC 000216 | 6 | Full survey |
| 110 | Offaly | 6410 | SAC 000216 | 4 | Full survey |
| 111 | Roscommon | 6510 | SAC 000216 | 6 | Full survey |
| 113 | Roscommon | 6410 | SAC 000216 | 6 | Full survey |
| 114 | Roscommon | 6510 | SAC 000216 | 4 | Full survey |
| 120 | Offaly | 6210 | - | 4 | Full survey |
| 215 | Roscommon | *6210 | - | 8 | Full survey |
| 224 | Roscommon | *6210 | - | 4 | Full survey |
| 226 | Roscommon | 6210 | - | 3 | Full survey |
| 227 | Roscommon | 6210 | - | 4 | Full survey |
| 246 | Roscommon | 6210 | - | 4 | Full survey |
| 263 | Roscommon | 6210 | - | 4 | Full survey |
| 379 | Waterford | 6410 | - | 4 | Conifer forestry planted and one area reclassified |
| 601 | Cork | 6410 | - | 0 | Agricultural intensification |
| 618 | Cork | 6410 | - | 0 | Abandonment and one area reclassified |
| 627 | Cork | 6410 | SAC 002170 | 4 | Full survey |
| 717 | Monaghan | 6410 | NHA 1603 | 4 | Full survey |
| 802 | Leitrim | 6410 | SAC 000428 | 4 | Full survey |
| 804 | Leitrim | 6410 | - | 3 | Full survey |
| 815 | Leitrim | *6210 | pNHA 1421 | 4 | Full survey |
| 818 | Leitrim | 6210 | NHA 2435 | 8 | Full survey |
| 818 | Leitrim | 6410 | NHA 2435 | 4 | Full survey |
| 825 | Leitrim | *6210 | - | 4 | Full survey |
| 837 | Leitrim | 6410 | - | 0 | Conifer forestry was planted in 2009/10 |
| 849 | Leitrim | 6510 | pNHA 1920 | 0 | Unable to arrange access to the site |
| 850 | Leitrim | 6510 | - | 4 | Full survey |
| 872 | Leitrim | 6510 | - | 0 | Unable to arrange access to the site |
| 874 | Leitrim | 6410 | pNHA1643 | 8 | Full survey |
| 881 | Leitrim | 6410 | - | 4 | Full survey |

| GMS site | County | Target Annex I habitat | NPWS site no. | No. plots | Notes |
|----------|-----------|------------------------|---------------|-----------|---|
| 893 | Leitrim | 6410 | - | 4 | Full survey |
| 943 | Longford | 6510 | - | 4 | Full survey |
| 947 | Longford | 6410 | SAC 001818 | 3 | Full survey |
| 1051 | Cavan | 6510 | - | 4 | Full survey |
| 1067 | Cavan | *6210 | - | 4 | Full survey |
| 1087 | Cavan | 6510 | - | 4 | Full survey |
| 1142 | Donegal | 6410 | - | 4 | Full survey |
| 11248 | Donegal | 6410 | SAC 000138 | 5 | Full survey |
| 1248 | Donegal | 6510 | SAC 000138 | 4 | Full survey |
| 1249 | Donegal | 6410 | SAC 000138 | 4 | Full survey |
| 1250 | Donegal | *6210 | SAC 000191 | 6 | Full survey |
| 1250 | Donegal | 6410 | SAC 000191 | 8 | Full survey |
| 1266 | Donegal | *6210 | - | 4 | Full survey |
| 1272 | Donegal | *6210 | pNHA 2068 | 6 | Full survey |
| 1282 | Donegal | 6510 | - | 1 | Full survey |
| 1285 | Donegal | 6210 | - | 5 | Full survey |
| 1300 | Dublin | 6210 | SAC 001209 | 3 | Full survey |
| 1324 | Dublin | *6210 | - | 4 | Full survey |
| 1402 | Kildare | 6410 | pNHA 1772 | 3 | Full survey |
| 1423 | Kildare | 6210 | - | 4 | Full survey |
| 1501 | Sligo | 6210 | pNHA 1670 | 6 | Full survey |
| 1502 | Sligo | 6210 | NHA 2435 | 6 | Full survey |
| 1526 | Sligo | 6410 | - | 4 | Full survey |
| 1527 | Sligo | 6210 | NHA 2435 | 4 | Full survey |
| 1529 | Sligo | 6210 | SAC 00627 | 4 | Full survey |
| 1541 | Sligo | 6210 | SAC 001898 | 4 | Full survey |
| 1541 | Sligo | 6410 | SAC 001898 | 4 | Full survey |
| 1556 | Sligo | *6210 | SAC 001976 | 4 | Full survey |
| 1568 | Sligo | 6410 | - | 4 | Full survey |
| 1572 | Sligo | 6510 | - | 4 | Agricultural intensification and change in management |
| 1603 | Clare | 6410 | SAC 000994 | 4 | Full survey |
| 1608 | Clare | *6210 | SAC 000020 | 3 | Full survey |
| 1615 | Clare | *6210 | SAC 000020 | 4 | Full survey |
| 1616 | Clare | *6210 | SAC 001926 | 4 | Full survey |
| 1617 | Clare | *6210 | SAC 000020 | 6 | Full survey |
| 1623 | Clare | *6210 | SAC 00054 | 6 | Full survey |
| 1654 | Clare | 6210 | SAC 001926 | 6 | Full survey |
| 1671 | Clare | *6210 | - | 6 | Full survey |
| 1672 | Clare | *6210 | SAC 000054 | 4 | Full survey |
| 1696 | Clare | 6510 | SAC 100926 | 6 | Full survey |
| 1697 | Clare | 6410 | - | 6 | Full survey |
| 1697 | Clare | 6510 | - | 4 | Full survey |
| 1731 | Mayo | 6510 | SAC 002298 | 4 | Full survey |
| 1733 | Mayo | 6510 | SAC 002298 | 6 | Full survey |
| 1735 | Mayo | 6510 | SAC 002298 | 6 | Full survey |
| 1744 | Mayo | 6410 | SAC 001899 | 2 | Only two plots within an abandoned area of 6410 were assessed |
| 1827 | Mayo | 6410 | - | 4 | Full survey |
| 1839 | Mayo | *6210 | SAC 001774 | 4 | Full survey |
| 1853 | Mayo | *6210 | - | 4 | Full survey |
| 1864 | Mayo | *6210 | SAC 001536 | 4 | Full survey |
| 1864 | Mayo | 6510 | - | 4 | Full survey |
| 1865 | Mayo | *6210 | SAC 000479 | 4 | Full survey |
| 2000 | Westmeath | 6510 | - | 4 | Full survey |

| GMS site | County | Target Annex I habitat | NPWS site no. | No. plots | Notes |
|----------|-----------|------------------------|---------------|-----------|------------------------------|
| 2001 | Westmeath | *6210 | SAC 001831 | 4 | Full survey |
| 2012 | Westmeath | 6410 | SAC 000440 | 4 | Full survey |
| 2113 | Carlow | 6210 | pNHA 797 | 4 | Full survey |
| 2259 | Galway | *6210 | - | 4 | Full survey |
| 2260 | Galway | *6210 | - | 0 | Agricultural intensification |
| 2267 | Galway | *6210 | - | 8 | Full survey |
| 2271 | Galway | *6210 | SAC 001926 | 4 | Full survey |
| 2273 | Galway | *6210 | - | 6 | Full survey |
| 2282 | Galway | *6210 | - | 8 | Full survey |
| 2303 | Galway | 6210 | - | 0 | Agricultural intensification |
| 2307 | Galway | *6210 | SAC 000606 | 4 | Full survey |
| 2307 | Galway | 6410 | SAC 000606 | 4 | Full survey |
| 2310 | Galway | *6210 | SAC 002244 | 4 | Full survey |
| 2329 | Galway | *6210 | NHA 254 | 4 | Full survey |
| 2345 | Galway | *6210 | SAC 002241 | 4 | Full survey |
| 2403 | Kerry | 6410 | SAC 000365 | 4 | Full survey |
| 2500 | Kilkenny | *6210 | SAC 000831 | 6 | Full survey |
| 2701 | Limerick | *6210 | SAC 000432 | 6 | Full survey |
| 2704 | Limerick | 6510 | SAC 002165 | 6 | Full survey |
| 2708 | Limerick | 6410 | SAC 002165 | 4 | Full survey |

¹Only a small sliver (<0.05ha) of site 1248 (6410) is within the SAC

Of the 110 sites visited, the target Annex I habitat for 55 sites was 6210/*6210, for 33 sites it was 6410 and for 22 sites it was 6510 (Table 3). Four of the sites visited were not surveyed due to problems with accessing the site, and a further seven GMS sites (379, 601, 618, 837, 1572, 2303 and 2260) were not fully surveyed due to the fact that no significant areas of Annex I grassland habitat could be located due to anthropogenic impacts such as forestry planting or agricultural intensification. For these seven sites the nature of the land use change meant that they have a low potential for habitat restoration and the sites will be removed from the monitoring programme. There were other monitoring sites, such as Coolderry (GMS site 82) where no areas of Annex I grassland habitat could be located but these sites were fully surveyed as they continued to be managed as semi-natural grasslands and had the potential, with the correct management, to be restored to the target Annex I grassland habitat within the next monitoring period (2019-2024). For six of the GMS sites, 226, 804, 947, 1300, 1248 (6410) and 1402, listed in Table 3, one of the monitoring plots was judged to have been erroneously recorded within a non-target Annex I habitat, such as plot 32 in site 947 which was recorded within an area of Hydrophilous tall herb (EU Annex I code 6430), or within an area of grassland where there was no evidence that it had been a target Annex I grassland habitat, such as plot 4 in site 226. Although these plots were not listed in Table 3 or utilised to assess the *Structure & functions* of the three target Annex I grassland habitats, they were retained within the Turboveg database submitted with the project deliverables, as were the four plots recorded within sites 379 and 1572 (discussed above) that were also not utilised to assess *Structure & functions*.

The 37 sites with 6210 habitat where individuals of the following less common orchid species were recorded during the baseline ISGS or GMS are currently listed as *6210 orchid-rich: *Anacamptis pyramidalis*, *Coeloglossum viride*, *Dactylorhiza fuchsii* v. *okellyi*, *Epipactis atrorubens*, *Gymnadenia conopsea*, *Listera ovata*, *Neotinea maculata*, *Ophrys apifera*, *Ophrys insectifera*, *Orchis mascula*, *Orchis morio*, *Platanthera bifolia*, *Platanthera chlorantha* and *Spiranthes spiralis*.

Of the 110 GMS sites surveyed between 2015 and 2017, 50 were within Special Areas of Conservation (SACs) and 15 were within Natural Heritage Areas (NHAs) or proposed NHAs.

The three parameters of *Area, Structure & functions* and *Future prospects* were assessed for each of the three target Annex I habitats based on the data collected from the 110 sites visited during the GMS.

3.2 Annex I habitat 6210 and *6210

3.2.1 Area parameter

During the GMS, 237.83ha of 6210/*6210 habitat were surveyed, representing 17% of the 1,416ha of the habitat that is currently mapped within the State. Of the national area of 6210/*6210, 71% (1,004ha) is within SACs and the habitat is listed as a Qualifying Interest (QI) for 95% (953ha) of this area. A total of 32% of the 6210/*6210 area surveyed during the GMS was within an SAC.

Table 4 The *Area* assessment results for 6210/*6210 (Fav=Favourable, U-I=Unfavourable-Inadequate; U-B=Unfavourable-Bad). The area data for the 54 sites with 6210/*6210 habitat mapped during the GMS are shown. The ISGS baseline data were revised to take account of any mapping refinement or changes in interpretation. The notes list the impacts that contributed to the loss in area.

| Site ID | Annex I habitat | ISGS area (ha) | GMS area (ha) | Area change (ha) | % change per year | Area assessment | Reason for area loss or gain |
|---------|-----------------|----------------|---------------|------------------|-------------------|-----------------|--|
| 1 | *6210 | 1.01 | 1.01 | 0 | 0 | Fav | |
| 3 | *6210 | 1.13 | 1.13 | 0 | 0 | Fav | |
| 8 | *6210 | 1.16 | 0.84 | -0.32 | -3.05 | U-B | Agricultural intensification, undergrazing |
| 120 | 6210 | 2.94 | 2.94 | 0 | 0 | Fav | |
| 215 | *6210 | 11.04 | 11.04 | 0 | 0 | Fav | |
| 224 | *6210 | 3.45 | 0.16 | -3.29 | -10.60 | U-B | Active quarry |
| 226 | 6210 | 3.53 | 1.62 | -1.91 | -6.02 | U-B | Agricultural intensification |
| 227 | 6210 | 1.54 | 1.10 | -0.44 | -3.17 | U-B | Agricultural intensification |
| 246 | 6210 | 2.42 | 1.64 | -0.78 | -3.60 | U-B | Agricultural intensification |
| 263 | 6210 | 44.11 | 9.39 | -34.72 | -8.75 | U-B | Agricultural intensification, succession to scrub due to undergrazing, active quarry |
| 815 | *6210 | 1.88 | 1.88 | 0 | 0 | Fav | |
| 818 | 6210 | 13.70 | 13.70 | 0 | 0 | Fav | |
| 825 | *6210 | 2.82 | 2.82 | 0 | 0 | Fav | |
| 1067 | *6210 | 2.32 | 2.32 | 0 | 0 | Fav | |
| 1250 | *6210 | 10.76 | 10.76 | 0 | 0 | Fav | |
| 1266 | *6210 | 14.38 | 4.26 | -10.12 | -10.05 | U-B | Undergrazing, wind turbines |
| 1272 | *6210 | 17.33 | 14.96 | -2.37 | -1.96 | U-B | Undergrazing |
| 1285 | 6210 | 7.47 | 7.47 | 0 | 0 | Fav | |
| 1300 | 6210 | 3.95 | 3.95 | 0 | 0 | Fav | |
| 1324 | *6210 | 1.21 | 1.21 | 0 | 0 | Fav | |

| Site ID | Annex I habitat | ISGS area (ha) | GMS area (ha) | Area change (ha) | % change per year | Area assessment | Reason for area loss or gain |
|---------|-----------------|----------------|---------------|------------------|-------------------|-----------------|---|
| 1423 | 6210 | 1.32 | 1.32 | 0 | 0 | Fav | |
| 1501 | 6210 | 15.06 | 15.06 | 0 | 0 | Fav | |
| 1502 | 6210 | 7.14 | 7.14 | 0 | 0 | Fav | |
| 1527 | 6210 | 3.49 | 3.49 | 0 | 0 | Fav | |
| 1529 | 6210 | 1.05 | 1.05 | 0 | 0 | Fav | |
| 1541 | 6210 | 1.90 | 1.90 | 0 | 0 | Fav | |
| 1556 | *6210 | 5.86 | 4.43 | -1.43 | -3.48 | U-B | Undergrazing |
| 1608 | *6210 | 5.86 | 5.86 | 0 | 0 | Fav | |
| 1615 | *6210 | 4.71 | 4.57 | -0.14 | -0.49 | U-I | Succession to scrub due to undergrazing |
| 1616 | *6210 | 2.72 | 1.83 | -0.90 | -5.50 | U-B | Abandonment with no grazing recorded |
| 1617 | *6210 | 4.83 | 4.83 | 0 | 0 | Fav | |
| 1623 | *6210 | 8.20 | 8.20 | 0 | 0 | Fav | |
| 1654 | 6210 | 4.82 | 7.50 | 2.68 | 9.28 | Fav | Scrub removal |
| 1671 | *6210 | 12.29 | 12.29 | 0 | 0 | Fav | |
| 1672 | *6210 | 1.25 | 1.43 | 0.18 | 2.43 | Fav | Scrub removal |
| 1839 | *6210 | 1.69 | 1.69 | 0 | 0 | Fav | |
| 1853 | *6210 | 3.46 | 3.46 | 0 | 0 | Fav | |
| 1864 | *6210 | 3.66 | 0.72 | -2.94 | -13.41 | U-B | Agricultural intensification |
| 1865 | *6210 | 5.06 | 3.94 | -1.12 | -3.68 | U-B | Succession to scrub due to undergrazing |
| 2001 | *6210 | 0.46 | 0.46 | 0 | 0 | Fav | |
| 2113 | 6210 | 1.02 | 0.85 | -0.17 | -3.30 | U-B | Active quarry |
| 2259 | *6210 | 1.04 | 1.04 | 0 | 0 | Fav | |
| 2260 | *6210 | 1.84 | 0 | -1.84 | -20 | U-B | Agricultural intensification |
| 2267 | *6210 | 10.31 | 10.31 | 0 | 0 | Fav | |
| 2271 | *6210 | 1.34 | 1.34 | 0 | 0 | Fav | |
| 2273 | *6210 | 4.98 | 4.98 | 0 | 0 | Fav | |
| 2282 | *6210 | 15.06 | 15.06 | 0 | 0 | Fav | |
| 2303 | 6210 | 18.63 | 0 | -18.63 | -20 | U-B | Agricultural intensification |
| 2307 | *6210 | 2.64 | 2.64 | 0 | 0 | Fav | |
| 2310 | *6210 | 29.91 | 2.43 | -27.49 | -18.38 | U-B | Undergrazing |
| 2329 | *6210 | 3.38 | 0.17 | -3.21 | -19.00 | U-B | Abandonment with no grazing recorded |
| 2345 | *6210 | 1.73 | 1.73 | 0 | 0 | Fav | |
| 2500 | *6210 | 5.59 | 5.59 | 0 | 0 | Fav | |
| 2701 | *6210 | 6.35 | 6.35 | 0 | 0 | Fav | |
| Total | | 346.78 | 237.83 | | | | |

¹The majority (19.6 ha) of the lost area in GMS site 263 was due to an active quarry

Of the 54 6210/*6210 sites surveyed, there was no area change at 63% (34 sites) of sites and at two sites in Co. Clare (GMS sites 1654 and 1672) the area had increased due to conservation measures such as scrub removal. At the remaining 33% (18 sites) of sites, the area had decreased, with a net loss of 108.96ha of habitat between the baseline ISGS and the GMS, which represents a 31% loss in habitat area. The main pressures that were contributing to the loss in area were undergrazing, recorded at seven of the 18 sites where a loss in area was recorded, and agricultural intensification, recorded at eight of the 18 sites. The remaining losses were due to abandonment or active quarries. At two sites in Co. Galway (GMS sites 2260 and 2303) the whole site was lost in both cases due to agricultural intensification following the recent sale of the land.

As part of the Article 17 reporting, the *Area* parameter was assessed at each site utilising the criteria listed in Table 1. The 36 sites with no area loss, or with a gain in area, were assessed as Favourable. The one site which lost area but at a rate that was not greater than 1% per annum was assessed as Unfavourable-Inadequate. The remaining 17 sites which lost 6210/*6210 area at a rate greater than 1% per annum were assessed as Unfavourable-Bad. The largest loss in area was at site 263 in Co. Roscommon, where the majority of the 34.72ha lost was due to an active quarry and undergrazing, as the quarry no longer had grazers on the land.

Although the majority of the areas of 6210/*6210 were lost from outside the SAC network, 34.85ha were lost from within the SAC network, including three SACs, East Burren Complex SAC, Black Head-Poulsallagh Complex SAC, and Lough Gill SAC, 6210/*6210, which list 6210/*6210 as a Qualifying Interest (QI) (Table 5). Within the East Burren Complex SAC, positive conservation measures, such as scrub clearance and reducing stocking density within GMS site 1654, have created an additional 2.68ha of 6210/*6210 habitat that has more than compensated for the 1.96ha lost from the SAC. The large areas of 6210/*6210 lost from Ardahan Grassland SAC was due to changes in the grazing regime that resulted in the development of a more rank *Molinia caerulea*-dominated sward since the baseline ISGS survey in 2012.

Table 5 6210/*6210 area losses that occurred within SACs. It is indicated if 6210/*6210 is a Qualifying Interest (QI) within the SAC

| Site ID | Area lost from SAC (ha) | SAC name | SAC code | QI |
|--------------|-------------------------|------------------------------------|----------|-----|
| 1556 | 0.16 | Lough Gill SAC | 001976 | Yes |
| 1615 | 1.26 | Black Head-Poulsallagh Complex SAC | 000020 | Yes |
| 1616 | 0.74 | East Burren Complex SAC | 001926 | Yes |
| 1654 | 1.22 | East Burren Complex SAC | 001926 | Yes |
| 1864 | 2.90 | Macorha Lough SAC | 001536 | No |
| 1865 | 1.11 | Cloughmoyne SAC | 000479 | No |
| 2310 | 27.46 | Ardahan Grassland SAC | 002244 | No |
| Total | 34.85 | | | |

3.2.2 Structure & functions parameter

The individual assessment criteria listed in Appendix 1 were assessed at 244 6210/*6210 monitoring plots recorded at 52 sites. At two sites in Galway (GMS sites 2260 and 2303) where the whole site was lost due to agricultural intensification, no further monitoring was carried out.

Table 6 Pass rates of criteria used in *Structure & functions* assessments for 6210/*6210. Note: A monitoring stop fails if even one criterion fails; expert judgement may be exercised to override marginal failures.

| Assessment Criteria | % monitoring stops that passed each criterion |
|--|---|
| Positive indicator species (HQ) | 91 |
| Positive indicator species (HQ + Non-HQ) | 87 |
| Non-native species | 99 |
| Individual negative indicator species | 93 |
| Total cover negative indicator species | 95 |
| Encroachment | 95 |
| Sward height | 93 |
| Litter cover | 95 |
| Bare soil cover | 98 |
| Grazing & disturbance | 99 |
| Forb-to-graminoid ratio | 94 |
| Pass rate for monitoring stops before expert judgement applied | 68 |
| Pass rate for monitoring stops after expert judgement applied | 80 |

The results from the GMS are very similar to the data presented in O'Neill *et al.* (2013) where the pass rate was 74% after expert judgement had been applied. The criterion where there was the biggest change between the baseline ISGS and GMS was the forb-to-graminoid ratio, where 85% of stops passed this criterion during the ISGS and 94% passed during the GMS. The reason for this is that the criterion was changed at the start of the GMS to allow stops with a 30% forb-to-graminoid ratio to pass the criterion rather than the cut-off of 40% which was used during the ISGS. Expert judgement was applied to pass 36 monitoring stops. Two common reasons for passing stops based on expert judgement were high-quality positive indicator species within 20 m of the stop and 'near misses' where the forb-to-graminoid criterion had narrowly failed. No site-specific local assessment criteria were applied for the 6210/*6210 habitat but for upland examples of the habitat, which can often be bryophyte-rich, the bryophytes *Ditrichum gracile*, *Hypnum lacunosum*, *Scapania aspera* and *Tortella tortuosa* were included as positive indicator species (Appendix 1).

Table 7 presents the *Structure & functions* parameter on a site basis, with 52% (27 sites) of sites Favourable, 23% (12 sites) Unfavourable-Inadequate, and 25% (13 sites) Unfavourable-Bad. At three of the GMS sites, all of the monitoring stops failed the *Structure & functions* assessment.

Of the 12 GMS sites with Unfavourable-Inadequate *Structure & functions*, three sites, 1300, 1556 and 1617, are within SACs where the 6210/*6210 habitat is listed as a Qualifying Interest (QI): Glenasmole Valley SAC (site code 001209), Lough Gill SAC (site code 001976) and Black Head-Poulsallagh Complex SAC (site code 000020) respectively. One of the 13 GMS sites with Unfavourable-Bad *Structure & functions* is within an SAC where 6210/*6210 is a QI. This is monitoring site 1541, which is within the Unshin River SAC (site code 001898).

Table 7 *Structure & functions* assessment results for 6210/*6210. The number of plots that pass/fail the assessment criteria and the total number of plots recorded at each of the 52 GMS sites are shown.

| Site ID | Annex I habitat | Pass | Fail | Total | % Pass | <i>Structure & functions</i> assessment |
|---------|-----------------|------|------|-------|--------|---|
| 1 | *6210 | 4 | 0 | 4 | 100% | Favourable |
| 3 | *6210 | 4 | 0 | 4 | 100% | Favourable |
| 8 | *6210 | 2 | 2 | 4 | 50% | Unfavourable-Bad |
| 120 | 6210 | 4 | 0 | 4 | 100% | Favourable |
| 215 | *6210 | 7 | 1 | 8 | 88% | Unfavourable-Inadequate |
| 224 | *6210 | 1 | 3 | 4 | 25% | Unfavourable-Bad |
| 226 | 6210 | 3 | 0 | 3 | 100% | Favourable |
| 227 | 6210 | 0 | 4 | 4 | 0% | Unfavourable-Bad |
| 246 | 6210 | 2 | 2 | 4 | 50% | Unfavourable-Bad |
| 263 | 6210 | 2 | 2 | 4 | 50% | Unfavourable-Bad |
| 815 | *6210 | 4 | 0 | 4 | 100% | Favourable |
| 818 | 6210 | 5 | 3 | 8 | 63% | Unfavourable-Bad |
| 825 | *6210 | 2 | 2 | 4 | 50% | Unfavourable-Bad |
| 1067 | *6210 | 3 | 1 | 4 | 75% | Unfavourable-Inadequate |
| 1250 | *6210 | 6 | 0 | 6 | 100% | Favourable |
| 1266 | *6210 | 2 | 2 | 4 | 50% | Unfavourable-Bad |
| 1272 | *6210 | 4 | 2 | 6 | 67% | Unfavourable-Bad |
| 1285 | 6210 | 5 | 0 | 5 | 100% | Favourable |
| 1300 | 6210 | 2 | 1 | 3 | 67% | Unfavourable-Inadequate ¹ |
| 1324 | *6210 | 0 | 4 | 4 | 0% | Unfavourable-Bad |
| 1423 | 6210 | 4 | 0 | 4 | 100% | Favourable |
| 1501 | 6210 | 5 | 1 | 6 | 83% | Unfavourable-Inadequate |
| 1502 | 6210 | 3 | 3 | 6 | 50% | Unfavourable-Bad |
| 1527 | 6210 | 3 | 1 | 4 | 75% | Unfavourable-Inadequate |
| 1529 | 6210 | 4 | 0 | 4 | 100% | Favourable |
| 1541 | 6210 | 0 | 4 | 4 | 0% | Unfavourable-Bad |
| 1556 | *6210 | 3 | 1 | 4 | 75% | Unfavourable-Inadequate |
| 1608 | *6210 | 3 | 0 | 3 | 100% | Favourable |
| 1615 | *6210 | 4 | 0 | 4 | 100% | Favourable |
| 1616 | *6210 | 4 | 0 | 4 | 100% | Favourable |
| 1617 | *6210 | 5 | 1 | 6 | 83% | Unfavourable-Inadequate |
| 1623 | *6210 | 6 | 0 | 6 | 100% | Favourable |
| 1654 | 6210 | 6 | 0 | 6 | 100% | Favourable |
| 1671 | *6210 | 6 | 0 | 6 | 100% | Favourable |
| 1672 | *6210 | 4 | 0 | 4 | 100% | Favourable |
| 1839 | *6210 | 4 | 0 | 4 | 100% | Favourable |
| 1853 | *6210 | 3 | 1 | 4 | 75% | Unfavourable-Inadequate |
| 1864 | *6210 | 4 | 0 | 4 | 100% | Favourable |
| 1865 | *6210 | 3 | 1 | 4 | 75% | Unfavourable-Inadequate |
| 2001 | *6210 | 4 | 0 | 4 | 100% | Favourable |
| 2113 | 6210 | 4 | 0 | 4 | 100% | Favourable |
| 2259 | *6210 | 4 | 0 | 4 | 100% | Favourable |
| 2267 | *6210 | 8 | 0 | 8 | 100% | Favourable |
| 2271 | *6210 | 4 | 0 | 4 | 100% | Favourable |
| 2273 | *6210 | 5 | 1 | 6 | 83% | Unfavourable-Inadequate |

| Site ID | Annex I habitat | Pass | Fail | Total | % Pass | Structure & functions assessment |
|---------|-----------------|------|------|-------|--------|----------------------------------|
| 2282 | *6210 | 7 | 1 | 8 | 88% | Unfavourable-Inadequate |
| 2307 | *6210 | 4 | 0 | 4 | 100% | Favourable |
| 2310 | *6210 | 3 | 1 | 4 | 75% | Unfavourable-Inadequate |
| 2329 | *6210 | 1 | 3 | 4 | 25% | Unfavourable-Bad |
| 2345 | *6210 | 4 | 0 | 4 | 100% | Favourable |
| 2500 | *6210 | 6 | 0 | 6 | 100% | Favourable |
| 2701 | *6210 | 6 | 0 | 6 | 100% | Favourable |

¹ The S&F assessment was changed, based on expert judgement, from Unfavourable-Bad to Unfavourable-Inadequate, as this is a three-stop site with only one stop that marginally failed

The approximate area of each site with Favourable *Structure & functions* was calculated based on the percentage of monitoring stops that were assessed to have passed the *Structure & functions* assessment (e.g. two of four stops passing the assessment is equivalent to 50% of the area having Favourable *Structure & functions*). Overall 196.49ha of the 6210/*6210 habitat that was assessed during the GMS had Favourable *Structure & functions*, representing 83% of the surveyed area.

Table 8 The area of 6210/*6210 habitat with Favourable *Structure & functions*. The area for each site was calculated by multiplying the area of 6210/*6210 mapped at the site by the % of monitoring stops that passed the assessment.

| Site ID | Annex I habitat | GMS area (ha) | % Pass | Favourable area (ha) |
|---------|-----------------|---------------|--------|----------------------|
| 1 | *6210 | 1.01 | 100% | 1.01 |
| 3 | *6210 | 1.13 | 100% | 1.13 |
| 8 | *6210 | 0.84 | 50% | 0.42 |
| 120 | 6210 | 2.94 | 100% | 2.94 |
| 215 | *6210 | 11.04 | 88% | 9.66 |
| 224 | *6210 | 0.16 | 25% | 0.04 |
| 226 | 6210 | 1.62 | 100% | 1.62 |
| 227 | 6210 | 1.10 | 0% | 0 |
| 246 | 6210 | 1.64 | 50% | 0.82 |
| 263 | 6210 | 9.39 | 50% | 4.70 |
| 815 | *6210 | 1.88 | 100% | 1.88 |
| 818 | 6210 | 13.7 | 63% | 8.56 |
| 825 | *6210 | 2.82 | 50% | 1.41 |
| 1067 | *6210 | 2.32 | 75% | 1.74 |
| 1250 | *6210 | 10.76 | 100% | 10.76 |
| 1266 | *6210 | 4.26 | 50% | 2.13 |
| 1272 | *6210 | 14.96 | 67% | 9.97 |
| 1285 | 6210 | 7.47 | 100% | 7.47 |
| 1300 | 6210 | 3.95 | 67% | 2.63 |
| 1324 | *6210 | 1.21 | 0% | 0 |
| 1423 | 6210 | 1.32 | 100% | 1.32 |

| Site ID | Annex I habitat | GMS area (ha) | % Pass | Favourable area (ha) |
|--------------|-----------------|---------------|--------|----------------------|
| 1501 | 6210 | 15.06 | 83% | 12.55 |
| 1502 | 6210 | 7.14 | 50% | 3.57 |
| 1527 | 6210 | 3.49 | 75% | 2.62 |
| 1529 | 6210 | 1.05 | 100% | 1.05 |
| 1541 | 6210 | 1.9 | 0% | 0 |
| 1556 | *6210 | 4.43 | 75% | 3.32 |
| 1608 | *6210 | 5.86 | 100% | 5.86 |
| 1615 | *6210 | 4.57 | 100% | 4.57 |
| 1616 | *6210 | 1.83 | 100% | 1.83 |
| 1617 | *6210 | 4.83 | 83% | 4.03 |
| 1623 | *6210 | 8.2 | 100% | 8.20 |
| 1654 | 6210 | 7.5 | 100% | 7.50 |
| 1671 | *6210 | 12.29 | 100% | 12.29 |
| 1672 | *6210 | 1.43 | 100% | 1.43 |
| 1839 | *6210 | 1.69 | 100% | 1.69 |
| 1853 | *6210 | 3.46 | 75% | 2.60 |
| 1864 | *6210 | 0.72 | 100% | 0.72 |
| 1865 | *6210 | 3.94 | 75% | 2.96 |
| 2001 | *6210 | 0.46 | 100% | 0.46 |
| 2113 | 6210 | 0.85 | 100% | 0.85 |
| 2259 | *6210 | 1.04 | 100% | 1.04 |
| 2267 | *6210 | 10.31 | 100% | 10.31 |
| 2271 | *6210 | 1.34 | 100% | 1.34 |
| 2273 | *6210 | 4.98 | 83% | 4.15 |
| 2282 | *6210 | 15.06 | 88% | 13.18 |
| 2307 | *6210 | 2.64 | 100% | 2.64 |
| 2310 | *6210 | 2.43 | 75% | 1.82 |
| 2329 | *6210 | 0.17 | 25% | 0.04 |
| 2345 | *6210 | 1.73 | 100% | 1.73 |
| 2500 | *6210 | 5.59 | 100% | 5.59 |
| 2701 | *6210 | 6.35 | 100% | 6.35 |
| Total | | 237.86 | | 196.49 |

3.2.3 *Future prospects parameter*

Prior to evaluating the *Future prospects* parameter, the activities, both positive and negative, recorded for the 6210/*6210 habitat during GMS were examined. These are shown in Tables 9 and 10, together with the intensity (high, medium or low), percentage of the habitat affected, and total frequency for each of the activities.

Thirty-one of the 48 negative activities recorded within the 6210/*6210 habitat are a result of abandonment and a lack of grazing or mowing (Table 9). Agricultural intensification and quarrying were the two activities where high intensity impacts were recorded at multiple sites. It should be

noted that no negative impacts were recorded at 44% (23 sites) of the fifty-two 6210/*6210 sites surveyed.

Table 10 lists the positive impacts recorded within the 6210/*6210 habitat. Non-intensive cattle grazing is the most frequently recorded positive impact, and all non-intensive grazing activities, including cattle, horses, sheep and mixed grazing, account for 46 of the 60 positive impacts that were recorded within the habitat. Grazing by non-domestic animals such as hare, rabbits and deer is the next most frequent positive impact.

The effects of negative and positive activities were considered in the context of each site's *Area and Structure & functions* assessment to make an overall *Future prospects* assessment for each of the fifty-two 6210/*6210 sites surveyed during the GMS. *Future prospects* over the next 12 years (two reporting periods) were assessed.

Table 9 Frequency of negative impacts, by intensity and % habitat affected, recorded in the fifty-two 6210/*6210 sites.

| Impact code | Impact description | Intensity | | | % habitat affected | | | No. of sites |
|---------------|---|-----------|--------|-----|--------------------|--------|------|--------------|
| | | High | Medium | Low | <25% | 26-75% | >75% | |
| K02.01 | Species composition change (succession) | | 7 | 6 | 6 | 6 | 1 | 13 |
| I02 | Problematic native species | | 2 | 8 | 7 | 1 | 2 | 10 |
| A04.03 | Abandonment, lack of grazing | 1 | 4 | 1 | 1 | | 5 | 6 |
| A02.01 | Agricultural intensification | 3 | 1 | | 2 | 1 | 1 | 4 |
| I01 | Invasive non-native species | 1 | 1 | 1 | 2 | 1 | | 3 |
| D01.01 | Paths and tracks | 1 | | 1 | 2 | | | 2 |
| C01.01 | Sand and gravel extraction | 2 | | | 2 | | | 2 |
| A03.03 | Abandonment, lack of mowing | 1 | | | | | 1 | 1 |
| A05.02 | Stock feeding | | | 1 | 1 | | | 1 |
| B02 | Forest management and use | | | 1 | 1 | | | 1 |
| C01 | Mining and quarrying | 1 | | | | 1 | | 1 |
| E04.01 | Agricultural structures | 1 | | | 1 | | | 1 |
| G01.03.02 | Off-road driving | | 1 | | 1 | | | 1 |
| G05.07 | Wrongly directed conservation measures | | 1 | | | | 1 | 1 |
| M | Climate change | | | 1 | | | 1 | 1 |
| Column Totals | | 11 | 17 | 20 | 26 | 10 | 12 | 48 |

Table 10 Frequency of positive impacts, by intensity and % habitat affected, in the 52 sites with 6210/*6210 habitat.

| Impact code | Impact description | Intensity | | | % habitat affected | | | No. of sites |
|---------------|------------------------------------|-----------|--------|-----|--------------------|--------|------|--------------|
| | | High | Medium | Low | <25% | 26-75% | >75% | |
| A04.02.01 | Non-intensive cattle grazing | 12 | 14 | 4 | 1 | 2 | 27 | 30 |
| K04.05 | Rabbit, hare or deer grazing | 2 | | 5 | 1 | 2 | 5 | 7 |
| A04.02.03 | Non-intensive horse grazing | 1 | 1 | 3 | 1 | | 4 | 5 |
| A04.02.05 | Non-intensive mixed animal grazing | 4 | | 1 | 1 | | 4 | 5 |
| A10.01 | Scrub removal | 5 | | | 5 | | | 5 |
| A04.02.02 | Non-intensive sheep grazing | 4 | | | | 1 | 3 | 4 |
| A04.02 | Non-intensive grazing | | 1 | 1 | | 1 | 1 | 2 |
| G01.02 | Walking or horseriding | | | 1 | | 1 | | 1 |
| Column Totals | | 28 | 16 | 16 | 9 | 7 | 44 | 60 |

The *Future prospects* assessment for the 52 sites with 6210/*6210 habitat surveyed during the GMS are shown in Table 11.

Table 11 *Future prospects* (FP) assessment for the 52 sites with 6210/*6210 habitat surveyed during the GMS. S&F=Structure & functions, Fav=Favourable, U-I=Unfavourable-Inadequate, U-B=Unfavourable-Bad.

| Site ID | Annex I habitat | FP of Area | FP of S&F | FP of habitat | Rationale |
|---------|-----------------|------------|-----------|---------------|---|
| 1 | *6210 | Fav | U-I | U-I | Negative impacts related to undergrazing are impacting on 100% of the habitat and although no stops failed the assessment, one stop only marginally passed with a high cover of the negative species <i>Dactylis glomerata</i> . Due to the negative trend in the S&F and significant negative impacts, the FP of S&F were judged to be Unfavourable-Inadequate |
| 3 | *6210 | Fav | Fav | Fav | No negative impacts recorded |
| 8 | *6210 | U-B | U-B | U-B | Negative impacts of agricultural intensification, and undergrazing |
| 120 | 6210 | Fav | Fav | Fav | No significant negative impacts recorded |
| 215 | *6210 | Fav | U-I | U-I | It was noted that the impact of wetter summers were having a negative impact on the species composition of the habitat. Although the management of the site has not been changed one of the stops failed the 2016 S&F assessment due to a lack of positive indicator species and a high cover of the negative species <i>Trifolium repens</i> . All stops had passed the S&F assessment in 2007 |
| 224 | *6210 | U-B | U-B | U-B | Negative impacts of undergrazing and an active quarry |
| 226 | 6210 | U-B | Fav | U-B | Negative impact of agricultural intensification |
| 227 | 6210 | U-B | U-B | U-B | Negative impact of agricultural intensification |
| 246 | 6210 | U-B | U-B | U-B | Negative impact of agricultural intensification |
| 263 | 6210 | U-B | U-B | U-B | Negative impacts of agricultural intensification, succession to scrub due to undergrazing, and an active quarry |
| 815 | *6210 | Fav | Fav | Fav | No significant negative impacts recorded |
| 818 | 6210 | Fav | U-B | U-B | A high cover of the negative species <i>Trifolium repens</i> or the non-native <i>Epilobium brunnescens</i> caused three stops to fail the S&F assessment |

| Site ID | Annex I habitat | FP of Area | FP of S&F | FP of habitat | Rationale |
|---------|-----------------|------------|-----------|---------------|---|
| 825 | *6210 | Fav | U-B | U-B | Low sward height due to overgrazing and a low number of positive indicator species caused two stops to fail the S&F assessment |
| 1067 | *6210 | Fav | U-I | U-I | Negative impact of undergrazing recorded |
| 1250 | *6210 | Fav | Fav | Fav | No negative impacts recorded |
| 1266 | *6210 | U-B | U-B | U-B | Negative impact of undergrazing |
| 1272 | *6210 | U-B | U-B | U-B | Negative impacts of undergrazing and bracken |
| 1285 | 6210 | Fav | Fav | Fav | No negative impacts recorded |
| 1300 | 6210 | Fav | U-I | U-I | Only three of the four stops were utilised in the S&F assessment as one was judged to be outside the area of 6210. The S&F assessment was changed, based on expert judgement, from Unfavourable-Bad to Unfavourable-Inadequate, as this is a three-stop site with only one stop that marginally failed |
| 1324 | *6210 | Fav | U-B | U-B | Negative impact of abandonment with no mowing recorded |
| 1423 | 6210 | Fav | Fav | Fav | No negative impacts recorded |
| 1501 | 6210 | Fav | U-I | U-I | The 6210 habitat in the area above the cliffs is slightly overgrazed which is negatively impacting the S&F The S&F assessment indicates that there has been some agricultural improvement on the lower slopes of the site since 2010, and four of the six stops failed due to either high cover of <i>Trifolium repens</i> or low % forb cover |
| 1502 | 6210 | Fav | U-B | U-B | One stop failed the S&F assessment due to high cover of <i>Trifolium repens</i> with the cover of this species having increased from 1% in 2010 to 25% in 2017 |
| 1527 | 6210 | Fav | U-I | U-I | No significant negative impacts recorded |
| 1529 | 6210 | Fav | Fav | Fav | The grazing level at this site is currently too high with stops failing the S&F assessment due to a low sward height |
| 1541 | 6210 | Fav | U-B | U-B | Negative impact of undergrazing |
| 1556 | *6210 | U-B | U-I | U-B | No negative impacts recorded |
| 1608 | *6210 | Fav | Fav | Fav | Negative impact of succession to scrub due to undergrazing |
| 1615 | *6210 | U-I | Fav | U-I | Negative impact of abandonment with no grazing recorded |
| 1616 | *6210 | U-B | Fav | U-B | One stop failed the S&F assessment due to heath encroachment, the cover of heath at the stop has increased from 1% in 2011 to 15% in 2017 |
| 1617 | *6210 | Fav | U-I | U-I | No negative impacts recorded |
| 1623 | *6210 | Fav | Fav | Fav | The conservation measure of scrub removal was recorded at the site to manage against scrub encroachment |
| 1654 | 6210 | Fav | Fav | Fav | No negative impacts recorded |
| 1671 | *6210 | Fav | Fav | Fav | The conservation measure of scrub removal was recorded at the site to manage against scrub encroachment |
| 1672 | *6210 | Fav | Fav | Fav | No significant negative impacts recorded |
| 1839 | *6210 | Fav | Fav | Fav | One stop failed the S&F assessment due to a high cover of <i>Trifolium repens</i> and a lack of positive indicator species. Due to <i>Prunus spinosa</i> seedlings being recorded within three of the four plots in 2017 and this species not being present in any of the plots in 2011 the negative impact of succession was noted |
| 1853 | *6210 | Fav | U-I | U-I | Negative impact of agricultural intensification |
| 1864 | *6210 | U-B | Fav | U-B | Negative impact of succession to scrub due to undergrazing |
| 1865 | *6210 | U-B | U-I | U-B | No negative impacts recorded |
| 2001 | *6210 | Fav | Fav | Fav | Negative impact of an active quarry |
| 2113 | 6210 | U-B | Fav | U-B | No negative impacts recorded |
| 2259 | *6210 | Fav | Fav | Fav | No negative impacts recorded |

| Site ID | Annex I habitat | FP of Area | FP of S&F | FP of habitat | Rationale |
|---------|-----------------|------------|-----------|---------------|--|
| 2267 | *6210 | Fav | Fav | Fav | No negative impacts recorded |
| 2271 | *6210 | Fav | Fav | Fav | Negative impacts of scrub encroachment and bracken were noted at the site but only at a low level and based on expert judgement <i>FP</i> were judged to be Favourable |
| 2273 | *6210 | Fav | U-I | U-I | One stop failed the <i>S&F</i> assessment due to a high cover of <i>Dactylis glomerata</i> that was contributing to a ranker sward |
| 2282 | *6210 | Fav | U-I | U-I | One stop failed the <i>S&F</i> assessment due to a 10% cover of bracken and heath |
| 2307 | *6210 | Fav | Fav | Fav | No negative impacts recorded |
| 2310 | *6210 | U-B | U-I | U-B | Negative impact of undergrazing |
| 2329 | *6210 | U-B | U-B | U-B | Negative impact of abandonment with no grazing recorded |
| 2345 | *6210 | Fav | Fav | Fav | No negative impacts recorded |
| 2500 | *6210 | Fav | Fav | Fav | No negative impacts recorded |
| 2701 | *6210 | Fav | Fav | Fav | No negative impacts recorded |

The detailed notes provided in the rationale column of Table 11 provided information for the monitoring report that was written for each site and is presented in the updated ISGS Access database. Where possible, management recommendations were also presented within the monitoring report and these recommendations should be utilised to inform future conservation measures.

3.2.4 Overall conservation assessment at the site level

The assessments of the individual parameters at each site were combined according to the evaluation matrix in Table 1 to obtain the overall conservation assessment for the 6210/*6210 habitat at each site. This resulted in 40% (21 sites) receiving a Favourable assessment across the three parameters, 21% (11 sites) received an Unfavourable-Inadequate assessment, and 39% (20 sites) received an Unfavourable-Bad assessment (Table 12).

Table 12 Results of the overall conservation assessment at the site level for the 52 sites with 6210/*6210 habitat when all three parameters were assessed for the GMS. Fav=Favourable, U-I=Unfavourable-Inadequate; U-B=Unfavourable-Bad.

| Site ID | Site name | Annex I habitat | Area | Structure & Functions | Future prospects | Overall Conservation Status |
|---------|--|-----------------|------|-----------------------|------------------|-----------------------------|
| 1 | All Saints Bog | *6210 | Fav | Fav | U-I | U-I |
| 3 | Ridge Road | 6210 | Fav | Fav | Fav | Fav |
| 8 | Drumakeenan, Eagle Hill and Perry's Mill | 6210 | U-B | U-B | U-B | U-B |
| 120 | Clonmacnoise Esker | 6210 | Fav | Fav | Fav | Fav |
| 215 | Carrickmore | 6210 | Fav | U-I | U-I | U-I |
| 224 | Cloonfineen | 6210 | U-B | U-B | U-B | U-B |
| 226 | Coolteige | 6210 | U-B | Fav | U-B | U-B |
| 227 | Carrownalassan | 6210 | U-B | U-B | U-B | U-B |
| 246 | Skrine | 6210 | U-B | U-B | U-B | U-B |
| 263 | Curry (Co. Roscommon) | 6210 | U-B | U-B | U-B | U-B |
| 815 | Sheemore | 6210 | Fav | Fav | Fav | Fav |
| 818 | Lugnafeighery | 6210 | Fav | U-B | U-B | U-B |
| 825 | Ballynaboll | 6210 | Fav | U-B | U-B | U-B |
| 1067 | Manragh Upper | *6210 | Fav | U-I | U-I | U-I |

| Site ID | Site name | Annex I habitat | Area | Structure & Functions | Future prospects | Overall Conservation Status |
|---------|---------------------|-----------------|------|-----------------------|------------------|-----------------------------|
| 1250 | St. John's Point | 6210 | Fav | Fav | Fav | Fav |
| 1266 | Legalton | 6210 | U-B | U-B | U-B | U-B |
| 1272 | Garvanagh (western) | 6210 | U-B | U-B | U-B | U-B |
| 1285 | Tober | 6210 | Fav | Fav | Fav | Fav |
| 1300 | Glenasmole Valley | 6210 | Fav | U-I | U-I | U-I |
| 1324 | Newbridge Demesne | 6210 | Fav | U-B | U-B | U-B |
| 1423 | Carrick Hill | 6210 | Fav | Fav | Fav | Fav |
| 1501 | Knocknarea | 6210 | Fav | U-I | U-I | U-I |
| 1502 | Edenbaum | 6210 | Fav | U-B | U-B | U-B |
| 1527 | Castlegal | 6210 | Fav | U-I | U-I | U-I |
| 1529 | Rosses Point | 6210 | Fav | Fav | Fav | Fav |
| 1541 | Cloonmacduff | 6210 | Fav | U-B | U-B | U-B |
| 1556 | Clogher beg | 6210 | U-B | U-I | U-B | U-B |
| 1608 | Ballyelly | 6210 | Fav | Fav | Fav | Fav |
| 1615 | Lislarheenmore | 6210 | U-I | Fav | U-I | U-I |
| 1616 | Keelhilla | 6210 | U-B | Fav | U-B | U-B |
| 1617 | Murrooghkilly | *6210 | Fav | U-I | U-I | U-I |
| 1623 | Rannagh West | *6210 | Fav | Fav | Fav | Fav |
| 1654 | Gortleka | 6210 | Fav | Fav | Fav | Fav |
| 1671 | Derreen West | *6210 | Fav | Fav | Fav | Fav |
| 1672 | Deelin More | *6210 | Fav | Fav | Fav | Fav |
| 1839 | Annies | *6210 | Fav | Fav | Fav | Fav |
| 1853 | Lissanisky | 6210 | Fav | U-I | U-I | U-I |
| 1864 | Knocknageeha | *6210 | U-B | Fav | U-B | U-B |
| 1865 | Ballisnahyny | 6210 | U-B | U-I | U-B | U-B |
| 2001 | Ballymachugh | *6210 | Fav | Fav | Fav | Fav |
| 2113 | Ballymoon Esker | 6210 | U-B | Fav | U-B | U-B |
| 2259 | Garraun North | *6210 | Fav | Fav | Fav | Fav |
| 2267 | Tarrea | *6210 | Fav | Fav | Fav | Fav |
| 2271 | Leagh South | *6210 | Fav | Fav | Fav | Fav |
| 2273 | Ballybuck South | *6210 | Fav | U-I | U-I | U-I |
| 2282 | Frenchfort | *6210 | Fav | U-I | U-I | U-I |
| 2307 | Cartron | *6210 | Fav | Fav | Fav | Fav |
| 2310 | Ardrahan Grasslands | *6210 | U-B | U-I | U-B | U-B |
| 2329 | Killure More | *6210 | U-B | U-B | U-B | U-B |
| 2345 | Portumna Demesne | *6210 | Fav | Fav | Fav | Fav |
| 2500 | Coolnacrutta | 6210 | Fav | Fav | Fav | Fav |
| 2701 | Barrigone | *6210 | Fav | Fav | Fav | Fav |

For the 14 sites (GMS sites 1 to 1067) surveyed during the baseline ISGS from 2007 to 2009, no baseline overall conservation status was presented in the ISGS Access database due to the lack of *Future prospects* data. For the remaining 38 GMS sites any comparisons made at an individual site level are of a limited value due to significant changes in the assessment methodology and areas surveyed at individual sites, either due to the division of GMS sites into management units (see Section 2.1) or changes in interpretation/refinement of mapping (see Section 2.3.1). During the GMS, 18 of these 38 sites were recorded as having Favourable conservation status, compared with only five of the same 38 sites that were surveyed during the baseline ISGS. None of the five sites (GMS site codes 1501, 1527, 1541, 2282, 2329) recorded as having Favourable conservation status during the ISGS were recorded as

Favourable during the GMS, but seven (GMS site codes 1266, 1324, 1502, 1556, 1865, 2113 and 2310) of the 14 sites recorded as Unfavourable-Bad during the ISGS remain Unfavourable-Bad (Table 12).

3.2.5 Overall national conservation assessment

Following EU guidance (DG Environment 2017), and using the data collected during the GMS, the following national assessment was made for the *Future prospects* (FP) of the *Area* and *Structure & functions* parameters for 6210/*6210.

| | <i>Area</i> parameter | | | <i>Structure & functions</i> parameter | | |
|------------|----------------------------------|-----------------------------|------------|--|--------------------------------|-------------|
| | Short-term (12 yrs) future trend | Current conservation status | FP | Short-term (12 yrs) future trend | Current conservation status | FP |
| 6210/*6210 | Very negative | Unfavourable-Bad | Bad | Stable | Unfavourable-Inadequate | Poor |

Area:

- The short-term (i.e., over the next 12 years) future trend for the area of 6210/*6210 is Very Negative based on the fact that 31% of the surveyed area was lost during the reporting period. In the short-term future the current pressures, such as agricultural intensification, abandonment and quarries, that are causing these losses in area are expected to continue to threaten the habitat.
- The current conservation status of the *Area* parameter has been assessed as Unfavourable-Bad. For 6210/*6210 this is due to the fact that, for the subsample of sites that were surveyed, >1% of the Annex I habitat area has been lost per annum and it is our opinion that the current area is >10% less than the favourable reference area for the habitat nationally.
- The *Future prospects* of the *Area* parameter are therefore assessed as Bad for 6210/*6210.

Structure and functions:

- The short-term future trend for the *Structure & functions* of 6210/*6210 is assessed as Stable as negative impacts such as agricultural intensification and abandonment are balanced by positive impacts such as non-intensive grazing.
- The current conservation status of the *Structure & functions* parameter for 6210/*6210 is Unfavourable-Inadequate as >75% but <90% of the habitat is in favourable condition.
- The *Future prospects* of the *Structure & functions* parameter are therefore assessed as Poor for 6210/*6210.

The assessments of the individual parameters of *Area*, *Structure & functions*, and *Future prospects*, were combined according to the evaluation matrix in Table 1 to obtain the overall national conservation assessment for the 6210/*6210 habitat. Following the guidelines for habitat assessment at a national level (DG Environment 2017), based on the results presented here and taking into account the area of 6210/*6210 with Favourable *Structure & functions* (Table 8 above), the estimated future trends of the habitat's *Area* and *Structure & functions* based on the pressures and threats operating on the habitat and positive management and conservation measures in place, the national overall conservation assessment result for the 6210/*6210 habitat is Unfavourable-Bad and the trend is Decreasing. The following data detailed in this report were used to arrive at these results:

- area losses of >1% per annum since the previous monitoring period;
- major pressures occurring on the 6210/*6210 habitat which appear to be impacting significantly on the habitat in the long term.

Table 13 Summary of the national conservation assessment of the 6210/*6210 habitat, based on the results of the GMS.

| Parameter | Conservation status | Trend | Future prospects |
|---|-------------------------|-------------------|------------------|
| <i>Area</i> | Unfavourable-Bad | Decreasing | Bad |
| <i>Structure & functions</i> | Unfavourable-Inadequate | Stable | Poor |
| OVERALL NATIONAL CONSERVATION ASSESSMENT | Unfavourable-Bad | Decreasing | Bad |

It should be noted that the data presented above do not include an assessment of the Range parameter; however, as the *Area* parameter is Unfavourable-Bad and decreasing, the assessment of Range will not change the overall conservation assessment. The Range parameter will be assessed as part of the National Conservation Assessment (NCA).

The overall NCA for 6210/*6210 is Unfavourable-Bad, as it was when it was previously reported in NPWS (2013). The overall trend has changed from stable, as reported in NPWS (2013), to decreasing and the reason for this change is the 31% of the surveyed area of 6210/*6210 reported lost during the GMS. It should be noted that previous reports on the status of the 6210/*6210 habitat (NPWS 2013; O'Neill *et al.* 2013) only had access to baseline data and were unable to find adequate historical data from which to accurately record the area of 6210/*6210 that had been lost due to pressures such as agricultural intensification.

3.3 Annex I habitat 6410

3.3.1 *Area* parameter

During the GMS, 167.87ha of 6410 habitat were surveyed, representing 29% of the 586ha of 6410 habitat that is currently mapped within the State. Thirty-six percent of the national area of 6410 is within SACs and the habitat is listed as a Qualifying Interest (QI) for 192ha of the 211ha within SACs. Seventy percent of the 6410 area surveyed during the GMS was within an SAC.

There was no area change at 85% (28 sites) of the 6410 sites surveyed. At the remaining five sites the area had decreased, with a net loss of 12.19ha of 6410 habitat between the baseline ISGS and the GMS, which represents a 7% loss in habitat area. All of the 12.19ha area loss occurred outside the SAC network. The main pressures that were contributing to the loss in area were abandonment or undergrazing, recorded at two sites, and new conifer plantations, also recorded at two sites. At four of the five sites where 6410 habitat was lost, all of the 6410 area recorded during the baseline ISGS survey had been lost.

Table 14 The area data for the 33 sites with 6410 habitat mapped during the GMS. The ISGS baseline data were revised to take account of any mapping refinement or changes in interpretation. The notes list the impacts that contributed to the loss in area. Fav=Favourable, U-I=Unfavourable-Inadequate; U-B=Unfavourable-Bad.

| Site ID | ISGS area (ha) | GMS area (ha) | Area change (ha) | % change per year | Area assessment | Reason for area loss |
|--------------|----------------|---------------|------------------|-------------------|-----------------|--------------------------------------|
| 107 | 33.94 | 33.94 | 0 | 0 | Fav | |
| 109 | 20.36 | 20.36 | 0 | 0 | Fav | |
| 110 | 1.61 | 1.61 | 0 | 0 | Fav | |
| 113 | 9.21 | 9.21 | 0 | 0 | Fav | |
| 379 | 0.47 | 0 | -0.47 | -14.29 | U-B | New conifer plantation |
| 601 | 3.42 | 0 | -3.42 | -14.29 | U-B | Agricultural intensification |
| 618 | 0.19 | 0 | -0.19 | -14.29 | U-B | Abandonment with no grazing recorded |
| 627 | 2.66 | 2.66 | 0 | 0 | Fav | |
| 717 | 2.66 | 2.66 | 0 | 0 | Fav | |
| 802 | 2.55 | 2.55 | 0 | 0 | Fav | |
| 804 | 1.93 | 1.93 | 0 | 0 | Fav | |
| 818 | 2.01 | 2.01 | 0 | 0 | Fav | |
| 837 | 2.73 | 0 | -2.73 | -14.29 | U-B | New conifer plantation |
| 874 | 17.24 | 11.86 | -5.38 | -5.20 | U-B | Undergrazing, new house built |
| 881 | 3.54 | 3.54 | 0 | 0 | Fav | |
| 893 | 1.57 | 1.57 | 0 | 0 | Fav | |
| 947 | 3.55 | 3.55 | 0 | 0 | Fav | |
| 1142 | 2.11 | 2.11 | 0 | 0 | Fav | |
| 1248 | 5.14 | 5.14 | 0 | 0 | Fav | |
| 1249 | 1.01 | 1.01 | 0 | 0 | Fav | |
| 1250 | 20.77 | 20.77 | 0 | 0 | Fav | |
| 1402 | 1.42 | 1.42 | 0 | 0 | Fav | |
| 1526 | 4.47 | 4.47 | 0 | 0 | Fav | |
| 1541 | 4.20 | 4.20 | 0 | 0 | Fav | |
| 1568 | 3.12 | 3.12 | 0 | 0 | Fav | |
| 1603 | 5.60 | 5.60 | 0 | 0 | Fav | |
| 1697 | 6.42 | 6.42 | 0 | 0 | Fav | |
| 1744 | 2.27 | 2.27 | 0 | 0 | Fav | |
| 1827 | 2.23 | 2.23 | 0 | 0 | Fav | |
| 2012 | 1.50 | 1.50 | 0 | 0 | Fav | |
| 2307 | 1.13 | 1.13 | 0 | 0 | Fav | |
| 2403 | 4.47 | 4.47 | 0 | 0 | Fav | |
| 2708 | 4.58 | 4.58 | 0 | 0 | Fav | |
| Total | 180.06 | 167.87 | | | | |

The *Area* parameter was assessed at each site utilising the criteria listed in Table 1. The 28 sites with no area loss were assessed as Favourable and the other five sites, which all lost 6410 area at a rate greater than 1% per annum, were assessed as Unfavourable-Bad. The largest loss in area was at GMS site 874 in Co. Roscommon, where 5.38ha were lost due to a combination of undergrazing and house construction.

3.3.2 Structure & functions parameter

The individual assessment criteria listed in Appendix 1 were assessed at 136 monitoring plots recorded at 29 sites. At the four sites (GMS site codes 379, 601, 618 and 837) where the whole site was lost, due to either refinements in the mapping or change in interpretation of the 6410 habitat or impacts such as forestry, no further monitoring was carried out.

Table 15 Pass rates of criteria used in *Structure & functions* assessments for 6410. Note: A monitoring stop fails if even one criterion fails; expert judgement may be exercised to override marginal failures.

| Assessment Criteria | % monitoring stops that passed each criterion |
|--|---|
| Positive indicator species (HQ) | 85 |
| Positive indicator species (HQ + Non-HQ) | 87 |
| Non-native species | 100 |
| Individual negative indicator species: no stops failed due to cover of <i>Polytrichum</i> spp. | 89 |
| Total cover negative indicator species | 97 |
| Encroachment | 99 |
| Sward height | 99 |
| Litter cover | 75 |
| Bare soil cover | 100 |
| Grazing & disturbance | 99 |
| Forb-to-graminoid ratio | 66 |
| Pass rate for monitoring stops before expert judgement applied | 34 |
| Pass rate for monitoring stops after expert judgement applied | 60 |

The results from the GMS are generally similar to the data presented in O'Neill *et al.* (2013) where the pass rate was 29% before expert judgement had been applied. The biggest change since the baseline ISGS survey was in the application of expert judgement, which was applied to 32 monitoring stops and resulted in the pass rate increasing to 60%, much higher than the 41% reported in O'Neill *et al.* (2013). Two common reasons for passing stops based on expert judgement were high-quality positive indicator species within 20 m of the stop and 'near misses' where the forb-to-graminoid ratio criterion had just failed.

Table 16 presents the *Structure & functions* parameter on a site basis with 28% (8 sites) of sites Favourable, 14% (4 sites) Unfavourable-Inadequate, and 58% (17 sites) Unfavourable-Bad. At four sites none of the monitoring stops passed the *Structure & functions* assessment.

Of the four GMS sites with Unfavourable-Inadequate *Structure & functions*, three sites – 107, 113 and 1249 – are within two SACs where the 6410 habitat is a QI: River Shannon Callows SAC (site code 000216) for sites 107 and 113, and Durnesh Lough SAC (site code 000138) for site 1249. Of the 17 GMS sites with Unfavourable-Bad *Structure & functions*, seven – 110, 802, 1250, 1541, 1603, 2403 and 2708 – are within an SAC where 6410 is a QI: River Shannon Callows SAC (site code 000216), Lough Melvin

SAC (site code 000428), St. John's Point SAC (site code 000191), Unshin River SAC (site code 001898), Ballyteige (Co. Clare) SAC (site code 000994), and Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC (site code 000365).

Table 16 *Structure & functions* assessment results for 6410. The number of monitoring plots that pass and fail the assessment criteria and the total number of plots recorded at each of the 29 sites surveyed during the GMS are shown.

| Site ID | Pass | Fail | Total | % Pass | Assessment |
|---------|------|------|-------|--------|-------------------------|
| 107 | 9 | 3 | 12 | 75% | Unfavourable-Inadequate |
| 109 | 8 | 0 | 8 | 100% | Favourable |
| 110 | 1 | 3 | 4 | 25% | Unfavourable-Bad |
| 113 | 5 | 1 | 6 | 83% | Unfavourable-Inadequate |
| 627 | 2 | 2 | 4 | 50% | Unfavourable-Bad |
| 717 | 0 | 4 | 4 | 0% | Unfavourable-Bad |
| 802 | 2 | 2 | 4 | 50% | Unfavourable-Bad |
| 804 | 1 | 2 | 3 | 33% | Unfavourable-Bad |
| 818 | 1 | 3 | 4 | 25% | Unfavourable-Bad |
| 874 | 4 | 4 | 8 | 50% | Unfavourable-Bad |
| 881 | 4 | 0 | 4 | 100% | Favourable |
| 893 | 4 | 0 | 4 | 100% | Favourable |
| 947 | 3 | 0 | 3 | 100% | Favourable |
| 1142 | 3 | 1 | 4 | 75% | Unfavourable-Inadequate |
| 1248 | 5 | 0 | 5 | 100% | Favourable |
| 1249 | 3 | 1 | 4 | 75% | Unfavourable-Inadequate |
| 1250 | 3 | 5 | 8 | 38% | Unfavourable-Bad |
| 1402 | 2 | 1 | 3 | 67% | Unfavourable-Bad |
| 1526 | 1 | 3 | 4 | 25% | Unfavourable-Bad |
| 1541 | 1 | 3 | 4 | 25% | Unfavourable-Bad |
| 1568 | 4 | 0 | 4 | 100% | Favourable |
| 1603 | 0 | 4 | 4 | 0% | Unfavourable-Bad |
| 1697 | 6 | 0 | 6 | 100% | Favourable |
| 1744 | 0 | 2 | 2 | 0% | Unfavourable-Bad |
| 1827 | 2 | 2 | 4 | 50% | Unfavourable-Bad |
| 2012 | 1 | 3 | 4 | 25% | Unfavourable-Bad |
| 2307 | 4 | 0 | 4 | 100% | Favourable |
| 2403 | 0 | 4 | 4 | 0% | Unfavourable-Bad |
| 2708 | 2 | 2 | 4 | 50% | Unfavourable-Bad |

The approximate area of each site with Favourable *Structure & functions* was calculated based on the percentage of monitoring stops that were assessed to have passed the *Structure & functions* assessment (e.g. two of four stops passing the assessment is equivalent to 50% of the area having Favourable *Structure & functions*). Overall 105.14ha of the 6410 habitat that was assessed during the GMS had Favourable *Structure & functions*, representing 63% of the surveyed area.

Table 17 The area of 6410 habitat with Favourable *Structure & functions*. The area for each site was calculated by multiplying the area of 6410 mapped at the site by the % of monitoring stops that passed the assessment.

| Site ID | GMS area (ha) | % Pass | Favourable area (ha) |
|--------------|---------------|--------|----------------------|
| 107 | 33.94 | 75% | 25.46 |
| 109 | 20.36 | 100% | 20.36 |
| 110 | 1.61 | 25% | 0.40 |
| 113 | 9.21 | 83% | 7.64 |
| 627 | 2.66 | 50% | 1.33 |
| 717 | 2.66 | 0% | 0 |
| 802 | 2.55 | 50% | 1.28 |
| 804 | 1.93 | 33% | 0.64 |
| 818 | 2.01 | 25% | 0.50 |
| 874 | 11.86 | 50% | 5.93 |
| 881 | 3.54 | 100% | 3.54 |
| 893 | 1.57 | 100% | 1.57 |
| 947 | 3.55 | 100% | 3.55 |
| 1142 | 2.11 | 75% | 1.58 |
| 1248 | 5.14 | 100% | 5.14 |
| 1249 | 1.01 | 75% | 0.76 |
| 1250 | 20.77 | 38% | 7.89 |
| 1402 | 1.42 | 67% | 0.95 |
| 1526 | 4.47 | 25% | 1.12 |
| 1541 | 4.2 | 25% | 1.05 |
| 1568 | 3.12 | 100% | 3.12 |
| 1603 | 5.6 | 0% | 0 |
| 1697 | 6.42 | 100% | 6.42 |
| 1744 | 2.27 | 0% | 0 |
| 1827 | 2.23 | 50% | 1.12 |
| 2012 | 1.5 | 25% | 0.38 |
| 2307 | 1.13 | 100% | 1.13 |
| 2403 | 4.47 | 0% | 0 |
| 2708 | 4.58 | 50% | 2.29 |
| Total | 167.89 | | 105.14 |

3.3.3 Future prospects parameter

Prior to evaluating the *Future prospects* parameter, the activities, both positive and negative, recorded for the 6410 habitat during GMS were examined. These are shown in Tables 18 and 19, together with the intensity (high, medium or low), percentage of the habitat affected, and total frequency for each of the activities.

Nine of the 16 negative impacts recorded within the 6410 habitat were related to abandonment (K02.01, A04.03, and A03.03) (Table 18). Although the maintenance of drainage ditches can be important in preventing the 6410 habitat becoming waterlogged, the building of new large ditches that could contribute to the habitat becoming too dry are scored as a negative impact, as was the case at Dunlavin Marshes (GMS site 1402, Co. Kildare). It should be noted that no negative impacts were

recorded at 18 (62%) of the twenty-nine 6410 sites surveyed. Although the impact of forestry is not listed within Table 18, as it was not recorded within the twenty-nine 6410 sites that were surveyed, it was responsible for the loss of two 6410 sites, Tobernahulla (GMS site 379, Co. Waterford) and Corry (GMS site 837, Co. Leitrim).

Table 18 Frequency of negative impacts, by intensity and % habitat affected, in the twenty-nine 6410 sites.

| Impact code | Impact description | Intensity | | | % habitat affected | | | No. of sites |
|----------------------|---|-----------|--------|-----|--------------------|--------|------|--------------|
| | | High | Medium | Low | <25% | 26-75% | >75% | |
| K02.01 | Species composition change (succession) | | 1 | 3 | 2 | 2 | | 4 |
| A04.03 | Abandonment, lack of grazing | | 3 | | | 2 | 1 | 3 |
| A03.03 | Abandonment, lack of mowing | 2 | | | 1 | | 1 | 2 |
| A05.02 | Stock feeding | 2 | | | 2 | | | 2 |
| G01.03.02 | Off-road motorized driving | | 1 | 1 | 2 | | | 2 |
| A04.01.01 | Intensive cattle grazing | | 1 | | | | 1 | 1 |
| J02.07.01 | Drainage ditches | 1 | | | | 1 | | 1 |
| J02.13 | Abandonment of management of water bodies | | 1 | | | | 1 | 1 |
| Column Totals | | 5 | 7 | 4 | 7 | 5 | 4 | 16 |

As for the 6210 habitat, non-intensive cattle grazing was the most frequently recorded positive impact within the 6410 habitat, and all non-intensive grazing activities, including cattle, horses and sheep, account for 24 of the 40 positive impacts that were recorded within the habitat. Non-intensive mowing is the second most frequent positive impact recorded within the 6410 habitat. Grazing by non-domestic animals such as hare, rabbits and deer is also an important positive impact at four sites. As discussed above, the sensitive maintenance of established drainage ditches is a positive impact on the 6410 habitat and this was recorded at two of the sites.

Table 19 Frequency of positive impacts, by intensity and % habitat affected, in the twenty-nine 6410 sites.

| Impact code | Impact description | Intensity | | | % of habitat affected | | | No. of sites |
|----------------------|------------------------------|-----------|--------|-----|-----------------------|--------|------|--------------|
| | | High | Medium | Low | <25% | 26-75% | >75% | |
| A04.02.01 | Non-intensive cattle grazing | 2 | 4 | 6 | 1 | 1 | 10 | 12 |
| A03.02 | Non-intensive mowing | 7 | | 1 | 1 | | 7 | 8 |
| A04.02.03 | Non-intensive horse grazing | 1 | 2 | 4 | 2 | 4 | 1 | 7 |
| K04.05 | Rabbit, hare or deer grazing | | | 4 | 1 | | 3 | 4 |
| A04.02.02 | Non-intensive sheep grazing | 1 | 2 | | | | 3 | 3 |
| A04.02 | Non-intensive grazing | 1 | | 1 | | 1 | 1 | 2 |
| J02.07.01 | Drainage ditches | | 1 | 1 | | | 2 | 2 |
| A04.01.02 | Intensive sheep grazing | | 1 | | | | 1 | 1 |
| J02.04.01 | Flooding | | 1 | | | | 1 | 1 |
| Column Totals | | 12 | 11 | 17 | 5 | 6 | 29 | 40 |

The effects of negative and positive activities were considered in the context of each site's *Area* and *Structure & functions* assessment to make an overall *Future prospects* assessment for each of the 29 6410 sites surveyed during the GMS. *Future prospects* over the next 12 years (two reporting periods) were assessed.

Table 20 Future prospects (FP) assessment for the twenty-nine 6410 sites surveyed during the GMS. *S&F*=*Structure & functions*, Fav=Favourable, U-I=Unfavourable-Inadequate; U-B=Unfavourable-Bad.

| Site ID | FP of <i>Area</i> | FP of <i>S&F</i> | FP of habitat | Rationale |
|---------|-------------------|----------------------|---------------|---|
| 107 | Fav | U-I | U-I | Due to a succession of wet summers some areas of the 6410 habitat at the site have not been mown every year, allowing a less species-rich rank sward to develop |
| 109 | Fav | Fav | Fav | No negative impacts recorded |
| 110 | Fav | U-B | U-B | Three of the four stops failed the <i>S&F</i> assessment with the largest area of 6410 having been heavily grazed prior to the survey in August 2015 |
| 113 | Fav | U-I | U-I | Some areas of rank grassland were recorded and one stop failed the <i>S&F</i> assessment due to insufficient positive indicator species and high litter cover |
| 627 | Fav | U-B | U-B | The largest area of 6410 was slightly undergrazed with a large amount of leaf litter within some of the monitoring stops |
| 717 | Fav | U-B | U-B | Within the north-eastern part of the site there has been a decline in the <i>S&F</i> of the 6410 habitat; sward height has increased and % forb cover has decreased since 2009, resulting in two stops failing the assessment |
| 802 | Fav | U-B | U-B | The 6410 habitat in the south of the site is undergrazed. One stop failed the <i>S&F</i> assessment due to a low % forb cover and another failed due to high cover of <i>Trifolium repens</i> |
| 804 | Fav | U-B | U-B | Since the baseline survey in 2009 positive indicator species such as <i>Succisa pratensis</i> appear to have declined and the negative species <i>Trifolium repens</i> has increased in cover. Possible agricultural improvement could have contributed to these changes. |
| 818 | Fav | U-B | U-B | Some stops failed the <i>S&F</i> assessment due to high cover of <i>Trifolium repens</i> or the non-native <i>Epilobium brunnescens</i> |
| 874 | U-B | U-B | U-B | Negative impact of undergrazing, and the building of a new house |
| 881 | Fav | Fav | Fav | No negative impacts recorded |
| 893 | Fav | Fav | Fav | No negative impacts recorded |
| 947 | Fav | Fav | Fav | No negative impacts recorded |
| 1142 | Fav | U-I | U-I | The site is slightly undergrazed with one stop failing the <i>S&F</i> assessment due to a rank sward with a high cover of litter and a low proportion of broadleaf herbs |
| 1248 | Fav | Fav | Fav | No negative impacts recorded |
| 1249 | Fav | U-I | U-I | The 6410 habitat at the site is in generally good condition with one monitoring stop failing the <i>S&F</i> assessment due to a high cover of the negative species <i>Trifolium repens</i> |
| 1250 | Fav | U-B | U-B | Some stops failed the <i>S&F</i> assessment due to a rank sward with excessive litter |
| 1402 | Fav | U-B | U-B | One stop failed the <i>S&F</i> assessment due to a low % forb cover which could indicate a lack of grazing at the site as two other stops only marginally passed the criterion. |
| 1526 | Fav | U-B | U-B | This site is currently undergrazed and in some areas a rank sward with a high litter cover has started to develop |

| Site ID | FP of Area | FP of S&F | FP of habitat | Rationale |
|---------|------------|-----------|---------------|--|
| 1541 | Fav | U-B | U-B | Two stops failed the S&F assessment due to the lack of a high-quality indicator species. The high-quality species <i>Dactylorhiza majalis</i> was recorded within the vicinity of the stops in 2010 but was not found during 2017. An increase in the stocking density at the site could be contributing to the lack of high-quality indicator species |
| 1568 | Fav | Fav | Fav | No negative impacts recorded |
| 1603 | Fav | U-B | U-B | A rank sward with high litter cover and a low % forb cover has developed due to undergrazing |
| 1744 | Fav | U-B | U-B | Negative impact of abandonment with no management of the 6410 habitat for over seven years |
| 1827 | Fav | U-B | U-B | In the wetter parts of the 6410 habitat the stops failed the S&F assessment due to a low % forb cover |
| 2012 | Fav | U-B | U-B | Negative impact of undergrazing |
| 2307 | Fav | Fav | Fav | No significant negative impacts recorded |
| 2403 | Fav | U-B | U-B | All stops failed the S&F assessment due to a high and increasing cover of the negative species <i>Trifolium repens</i> . In 2012 <i>T. repens</i> had a cover of no more than 10% in stops but in 2017 the cover was between 15% and 20% |
| 2708 | Fav | U-B | U-B | The 6410 habitat is slightly undergrazed, two stops failed the S&F assessment as a rank sward had developed and the litter cover is too high |

The detailed notes provided in the rationale column of Table 20 provided the information for the monitoring report that was written for each site and is presented in the updated ISGS Access database. Where possible, management recommendations were also included within the monitoring report and these recommendations should be used to inform future conservation measures.

3.3.4 Overall conservation assessment at the site level

The assessments of the individual parameters at each site were combined according to the evaluation matrix in Table 1 to obtain the overall conservation assessment for the 6410 habitat at each site. This resulted in 28% (8 sites) receiving a Favourable assessment across the three parameters, 14% (4 sites) received an Unfavourable-Inadequate assessment, and 59% (17 sites) received an Unfavourable-Bad assessment (Table 21).

For the 13 sites (GMS sites 107 to 947) surveyed during the baseline ISGS from 2007 to 2009, no baseline overall conservation status was presented in the ISGS Access database due to the lack of *Future prospects* data. For the remaining 16 GMS sites any comparisons made at an individual site level are of a limited value due to significant changes in the assessment methodology and areas surveyed at individual sites, either due to the division of GMS sites into management units (see Section 2.1) or changes in interpretation/refinement of mapping (see Section 2.3.1). However, the overall conservation status of the individual sites presented in Table 21 is very similar to the baseline ISGS data. During the GMS four of the 16 sites were recorded as having Favourable conservation status, compared with two of the same 16 sites that were surveyed during the baseline ISGS. The two sites (GMS site codes 1568 and 2307) recorded as having Favourable conservation status during the ISGS were also recorded as Favourable during the GMS. Also nine (GMS site codes 1250, 1402, 1541, 1603,

1744, 1827, 2012, 2403 and 2708) of the 12 sites recorded as Unfavourable-Bad during the ISGS remain Unfavourable-Bad (Table 21).

Table 21 Results of the overall conservation assessment for the twenty-nine 6410 sites when all three parameters were assessed for the GMS. FP=*Future prospects*, S&F=*Structure & functions*, Fav=Favourable, U-I=Unfavourable-Inadequate; U-B=Unfavourable-Bad.

| Site ID | Site name | Area | S&F | FP | Overall Conservation Status |
|---------|------------------------------|------|-----|-----|-----------------------------|
| 107 | Clonmacnoise | Fav | U-I | U-I | U-I |
| | Moystown Demesne and Bullock | | | | |
| 109 | Island | Fav | Fav | Fav | Fav |
| 110 | Clooncraff | Fav | U-B | U-B | U-B |
| 113 | Drumlosh | Fav | U-I | U-I | U-I |
| 627 | Garrison | Fav | U-B | U-B | U-B |
| 717 | Barratitoppy Upper | Fav | U-B | U-B | U-B |
| 802 | Gubacreeny | Fav | U-B | U-B | U-B |
| 804 | Gubalaun | Fav | U-B | U-B | U-B |
| 818 | Lugnafeighery | Fav | U-B | U-B | U-B |
| 874 | Hartley | U-B | U-B | U-B | U-B |
| 881 | Beihy | Fav | Fav | Fav | Fav |
| 893 | Gleneige | Fav | Fav | Fav | Fav |
| 947 | Cloondara | Fav | Fav | Fav | Fav |
| 1142 | Ardachrin | Fav | U-I | U-I | U-I |
| 1248 | Rossnowlagh Lower | Fav | Fav | Fav | Fav |
| 1249 | Drumhome (Lough Birra) | Fav | U-I | U-I | U-I |
| 1250 | St. John's Point | Fav | U-B | U-B | U-B |
| 1402 | Dunlavin Marshes | Fav | U-B | U-B | U-B |
| 1526 | Reask | Fav | U-B | U-B | U-B |
| 1541 | Cloonmacduff | Fav | U-B | U-B | U-B |
| 1568 | Derrysallagh | Fav | Fav | Fav | Fav |
| 1603 | Ballyteige | Fav | U-B | U-B | U-B |
| 1697 | Cream Point | Fav | Fav | Fav | Fav |
| 1744 | Cloonakillina | Fav | U-B | U-B | U-B |
| 1827 | Cogaula | Fav | U-B | U-B | U-B |
| 2012 | Creaghduff | Fav | U-B | U-B | U-B |
| 2307 | Cartron | Fav | Fav | Fav | Fav |
| 2403 | Bunrower | Fav | U-B | U-B | U-B |
| 2708 | Lacka (World's End) | Fav | U-B | U-B | U-B |

3.3.5 Overall national conservation assessment

Following EU guidance (DG Environment 2017), and using the data collected during the GMS, the following national assessment was made for the *Future prospects* (FP) of the *Area* and *Structure & functions* parameters for 6410.

| <i>Area parameter</i> | | | | <i>Structure & functions parameter</i> | | |
|-----------------------|----------------------------------|-----------------------------|------------|--|-----------------------------|------------|
| Habitat | Short-term (12 yrs) future trend | Current conservation status | FP | Short-term (12 yrs) future trend | Current conservation status | FP |
| 6410 | Negative | Unfavourable-Bad | Bad | Stable | Unfavourable-Bad | Bad |

Area:

- The short-term (i.e., over the next 12 years) future trend for the area of the habitat is assessed as Negative for 6410. In the short-term future the current pressures, such as abandonment and forestry, that are causing losses in area are expected to continue to threaten the habitat.
- The current conservation status of the *Area* parameter has been assessed as Unfavourable-Bad. For the 6410 habitat 1% of the Annex I habitat area per annum has been lost, and because it is our opinion that the current area of 6410 is >10% less than the favourable reference area for the habitat nationally the *Area* parameter was assessed as Unfavourable-Bad.
- The *Future prospects* of the *Area* parameter are therefore assessed as Bad.

Structure and functions:

- The short-term future trend for the *Structure & functions* of 6410 is assessed as Stable as negative impacts such as abandonment are balanced by positive impacts such as non-intensive grazing.
- The current conservation status of the *Structure & functions* parameter for 6410 has been assessed as Unfavourable-Bad as >25% of the habitat is in unfavourable condition.
- The *Future prospects* of the *Structure & functions* parameter are therefore assessed as Bad.

The assessments of the individual parameters were combined according to the evaluation matrix in Table 1 to obtain the overall national conservation assessment for the 6410 habitat.

Following the guidelines for habitat assessment at a national level (DG Environment 2017), based on the results presented here and taking into account the area of 6410 with Favourable *Structure & functions* (Table 17), the estimated future trends of the habitat's *Area* and *Structure & functions* based on the pressures and threats operating on the habitat and positive management and conservation measures in place, the national overall conservation assessment result for the 6410 habitat is Unfavourable-Bad and the trend is Decreasing. The following data detailed in this report were used to arrive at these results:

- area losses of 1% per annum for the 6410 habitat
- >25% of the surveyed area assessed has Unfavourable-Bad *Structure & functions*;
- major pressures occurring on the 6410 habitat which appear to be impacting significantly on the habitat in the long term.

It should be noted that the data presented above do not include an assessment of the Range parameter; however, as the *Area* parameter is Unfavourable-Bad and decreasing, the assessment of Range will not change the overall conservation assessment. The Range parameter will be assessed as part of the National Conservation Assessment (NCA).

The overall NCA for 6410 is Unfavourable-Bad and decreasing, as it was when it was previously reported in NPWS (2013).

Table 22 Summary of the national conservation assessment of the 6410 habitat, based on the results of the GMS.

| Parameter | Conservation status | Trend | Future prospects |
|---|-------------------------|-------------------|------------------|
| <i>Area</i> | Unfavourable-Bad | Decreasing | Bad |
| <i>Structure & functions</i> | Unfavourable-Bad | Stable | Bad |
| OVERALL NATIONAL CONSERVATION ASSESSMENT | Unfavourable-Bad | Decreasing | Bad |

3.4 Annex I habitat 6510

3.4.1 Area parameter

During the GMS, 60.64ha of 6510 habitat were surveyed, representing 39% of the 157ha of 6510 habitat that is currently mapped within the State. Forty-one percent of the national area of 6510 is within SACs and the habitat is listed as a Qualifying Interest (QI) for 48ha of the 64ha within SACs. A total of 57% of the 6510 area surveyed during the GMS was within an SAC.

There was no area change at 47% (nine sites) of the 6510 sites surveyed but at the remaining 10 sites the area had decreased, with a net loss of 23.33ha of 6510 habitat between the baseline ISGS and the GMS, which represents a 28% loss in habitat area. The main pressures that were contributing to the loss in area were agricultural intensification and fertiliser application, which accounted for nine of the 10 sites where 6510 habitat was lost. At four of the 10 sites where 6510 habitat was lost, all of the 6510 area recorded during the baseline ISGS survey had been lost. During the GMS it was noted that the area of 6510 habitat within Cullahill Mountain SAC (site code 000831) in Co. Kilkenny increased due to a change in management at the site, with a small 0.25ha area of 6510 habitat now managed by annual mowing. This area was not monitored as part of the GMS but could be included within future monitoring programmes.

The Area parameter was assessed at each site utilising the criteria listed in Table 1. The nine sites with no area loss were assessed as Favourable. The one site which lost area at a rate of less than 1% per annum was assessed as Unfavourable-Inadequate. The remaining nine sites which lost 6510 area at a rate greater than 1% per annum were assessed as Unfavourable-Bad. The largest loss in area was at GMS site 82 in Co. Offaly where 4.84ha of 6510 habitat were lost due to agricultural intensification.

Although the majority of the areas of 6510 were lost from outside the SAC network, 4.57ha were lost from within the SAC network. The 6510 habitat is listed as a QI for the River Shannon Callows SAC (site code 000216) and this is where almost all the 6510 habitat was lost from GMS sites 111 and 114 due to agricultural intensification.

Table 23 The area data for the nineteen 6510 sites mapped during the GMS. The ISGS baseline data were revised to take account of any mapping refinement or changes in interpretation. The notes list the impacts that contributed to the loss in area. Fav=Favourable, U-I=Unfavourable-Inadequate; U-B=Unfavourable-Bad.

| Site ID | ISGS area (ha) | GMS area (ha) | Area change (ha) | % change per year | Area assessment | Reason for area loss |
|---------|----------------|---------------|------------------|-------------------|-----------------|--|
| 82 | 4.84 | 0 | -4.84 | -12.50 | U-B | Agricultural intensification |
| 109 | 6.82 | 6.82 | 0 | 0 | Fav | |
| 111 | 10.49 | 6.28 | -4.21 | -4.46 | U-B | Agricultural intensification |
| 114 | 1.53 | 1.20 | -0.32 | -2.34 | U-B | Agricultural intensification |
| 850 | 2.32 | 2.32 | 0 | 0 | Fav | |
| 943 | 1.68 | 1.68 | 0 | 0 | Fav | |
| 1051 | 3.97 | 1.76 | -2.21 | -7.94 | U-B | Slurry spreading |
| 1087 | 1.79 | 0 | -1.79 | -14.29 | U-B | Agricultural intensification |
| 1248 | 3.28 | 3.28 | 0 | 0 | Fav | |
| 1282 | 3.91 | 0 | -3.91 | -14.29 | U-B | Annual disturbance due to agricultural show |
| 1572 | 2.42 | 0 | -2.42 | -14.29 | U-B | Application of slurry and chemical fertiliser, new stables built |
| 1696 | 8.57 | 8.57 | 0 | 0 | Fav | |
| 1697 | 1.98 | 1.98 | 0 | 0 | Fav | |
| 1731 | 2.15 | 2.15 | 0 | 0 | Fav | |
| 1733 | 8.66 | 7.43 | -1.23 | -2.36 | U-B | Agricultural intensification |
| 1735 | 9.65 | 9.65 | 0 | 0 | Fav | |
| 1864 | 2.10 | 1.99 | -0.12 | -0.93 | U-I | Agricultural intensification |
| 2000 | 2.35 | 0.06 | -2.29 | -16.25 | U-B | Agricultural intensification |
| 2704 | 5.48 | 5.48 | 0 | 0 | Fav | |
| Total | 83.97 | 60.64 | | | | |

3.4.2 *Structure & functions* parameter

The individual assessment criteria listed in Appendix 1 were assessed at 81 monitoring plots recorded at 18 sites. At site 1572 in Co. Sligo, four plots were recorded but the site was not fully surveyed as the whole site was lost due to a combination of agricultural intensification and re-structuring the land into horse paddocks and stables.

The results from the GMS indicate a general decline in the *Structure & functions* of the 6510 habitat since the baseline ISGS (O'Neill *et al.* 2013). The percentage of monitoring stops that passed the high-quality positive indicator species criterion dropped from 94% reported during the baseline ISGS to 81% reported during the GMS. For the positive indicator species criterion it dropped from a 79% pass rate in the baseline ISGS to the 60% reported during the GMS. Also, the percentage of stops passing the forb-to-graminoid ratio dropped from 92% reported during the baseline ISGS to 69% reported during the GMS. Due to this decline in the *Structure & functions* of the 6510 habitat, the pass rate after expert judgement was applied dropped from 63% reported during the baseline ISGS to 54% reported during the GMS.

Table 24 Pass rates of criteria used in *Structure & functions* assessments for 6510. Note: A monitoring stop fails if even one criterion fails; expert judgement may be exercised to override marginal failures.

| Assessment Criteria | % monitoring stops that passed each criterion |
|--|---|
| Positive indicator species (HQ) | 81 |
| Positive indicator species (HQ + Non-HQ) | 60 |
| Non-native species | 100 |
| Individual negative indicator species | 78 |
| Total cover negative indicator species | 88 |
| Encroachment | 100 |
| Sward height | 96 |
| Litter cover | 85 |
| Bare soil cover | 97 |
| Grazing & disturbance | 99 |
| Forb-to-graminoid ratio | 69 |
| Pass rate for monitoring stops before expert judgement applied | 37 |
| Pass rate for monitoring stops after expert judgement applied | 54 |

Table 25 presents the *Structure & functions* parameter on a site basis with 17% (3 sites) of sites Favourable, 22% (4 sites) Unfavourable-Inadequate, and 61% (11 sites) Unfavourable-Bad. At six of the GMS sites, none of the monitoring stops passed the *Structure & functions* assessment.

Table 25 *Structure & functions* assessment results for 6510. The number of monitoring plots that pass and fail the assessment criteria and the total number of plots recorded at each of the 18 sites surveyed during the GMS are shown.

| Site ID | Pass | Fail | Total | % Pass | 6510 condition |
|---------|------|------|-------|--------|-------------------------|
| 82 | 0 | 4 | 4 | 0% | Unfavourable-Bad |
| 109 | 6 | 0 | 6 | 100% | Favourable |
| 111 | 5 | 1 | 6 | 83% | Unfavourable-Inadequate |
| 114 | 4 | 0 | 4 | 100% | Favourable |
| 850 | 2 | 2 | 4 | 50% | Unfavourable-Bad |
| 943 | 3 | 1 | 4 | 75% | Unfavourable-Inadequate |
| 1051 | 2 | 2 | 4 | 50% | Unfavourable-Bad |
| 1087 | 0 | 4 | 4 | 0% | Unfavourable-Bad |
| 1248 | 3 | 1 | 4 | 75% | Unfavourable-Inadequate |
| 1282 | 0 | 1 | 1 | 0% | Unfavourable-Bad |
| 1696 | 5 | 1 | 6 | 83% | Unfavourable-Inadequate |
| 1697 | 4 | 0 | 4 | 100% | Favourable |
| 1731 | 0 | 4 | 4 | 0% | Unfavourable-Bad |
| 1733 | 2 | 4 | 6 | 33% | Unfavourable-Bad |
| 1735 | 4 | 2 | 6 | 67% | Unfavourable-Bad |
| 1864 | 2 | 2 | 4 | 50% | Unfavourable-Bad |
| 2000 | 0 | 4 | 4 | 0% | Unfavourable-Bad |
| 2704 | 0 | 6 | 6 | 0% | Unfavourable-Bad |

Only three of the sites in Table 25 have Favourable *Structure & functions*, whereas eight of the same 18 sites were reported to have Favourable *Structure & functions* during the baseline ISGS (O'Neill *et al.* 2013), further evidence for the deteriorating status of the 6510 habitat within Ireland.

Of the four GMS sites with Unfavourable-Inadequate *Structure & functions*, two sites, 111 and 1696, are within SACs where the 6510 habitat is a QI: River Shannon Callows SAC (site code 000216) and East Burren Complex SAC (site code 001926) respectively. Of the 11 GMS sites with Unfavourable-Bad *Structure & functions*, none are within an SAC where 6510 is a QI.

The approximate area of each site with Favourable *Structure & functions* was calculated based on the percentage of monitoring stops that were assessed to have passed the *Structure & functions* assessment (e.g. two of four stops passing the assessment is equivalent to 50% of the area having Favourable *Structure & functions*). Overall 38ha of the 6510 habitat that was assessed during the GMS had Favourable *Structure & functions*, representing 53% of the surveyed area.

Table 26 The area of 6510 habitat with Favourable *Structure & functions*. The area for each site was calculated by multiplying the area of 6510 mapped at the site by the % of monitoring stops that passed the assessment. *For the two sites where no area of 6510 was mapped during the GMS the baseline ISGS was utilised.

| Site ID | 6510 area (ha) | % Pass | Favourable area (ha) |
|--------------|-------------------|--------|-------------------------|
| *82 | 4.84 | 0% | 0 |
| 109 | 6.82 | 100% | 6.82 |
| 111 | 6.28 | 83% | 5.21 |
| 114 | 1.2 | 100% | 1.20 |
| 850 | 2.32 | 50% | 1.16 |
| 943 | 1.68 | 75% | 1.26 |
| 1051 | 1.76 | 50% | 0.88 |
| 1087 | 1.79 | 0% | 0 |
| 1248 | 3.28 | 75% | 2.46 |
| *1282 | 3.91 | 0% | 0 |
| 1696 | 8.57 | 83% | 7.11 |
| 1697 | 1.98 | 100% | 1.98 |
| 1731 | 2.15 | 0% | 0 |
| 1733 | 7.43 | 33% | 2.45 |
| 1735 | 9.65 | 67% | 6.47 |
| 1864 | 1.99 | 50% | 1.00 |
| 2000 | 0.06 | 0% | 0 |
| 2704 | 5.48 | 0% | 0 |
| Total | 71.19 | | 38.00 |

3.4.3 *Future prospects parameter*

Prior to evaluating the *Future prospects* parameter, the activities, both positive and negative, recorded for the 6510 habitat during GMS were examined. These are shown in Tables 27 and 28, together with the intensity (high, medium or low), percentage of the habitat affected, and total frequency for each of the activities.

For the 6510 habitat, agricultural intensification is the most frequent negative impact, recorded as a high-intensity impact at five of the seven sites where it occurred, and over greater than 75% of the 6510 habitat area at four of the seven sites (Table 27). The second most frequent negative impact of fertilisation is also linked with agricultural intensification. It should be noted that no negative impacts were recorded at five (28%) of the eighteen 6510 sites surveyed.

Fifteen of the eighteen 6510 sites visited during the GMS were managed by non-intensive mowing, with one of these sites managed by a combination of mowing and grazing (Table 28). Of the remaining three sites, one is currently abandoned (GMS site 2704, Aughinish Co. Limerick). The other two sites are managed by mowing but the impact was judged as neutral as one site is intensively managed (GMS site 82, Coolderry Co. Offaly), and the other has been highly disturbed as the meadow has been used as the venue for the local agricultural show (GMS site 1282, Coolcholly Co. Donegal).

Table 27 Frequency of negative impacts, by intensity and % habitat affected, in the eighteen 6510 sites.

| Impact code | Impact description | Intensity | | | % of habitat affected | | | No. of sites |
|----------------------|---|-----------|-----------|----------|-----------------------|----------|----------|--------------|
| | | High | Medium | Low | <25% | 26-75% | >75% | |
| A02.01 | Agricultural intensification | 5 | 1 | 1 | 2 | 1 | 4 | 7 |
| A08 | Fertilisation | | 3 | | | 1 | 2 | 3 |
| A03.03 | Abandonment, lack of mowing | | 2 | | 1 | | 1 | 2 |
| A05.02 | Stock feeding | | 1 | | | | 1 | 1 |
| A07 | Herbicide use | 1 | | | 1 | | | 1 |
| D01.01 | Paths and tracks | 1 | | | 1 | | | 1 |
| E04.01 | Agricultural structures | 1 | | | 1 | | | 1 |
| G05 | Other human disturbance (agricultural show) | 1 | | | | | 1 | 1 |
| I02 | Problematic native species | | 1 | | 1 | | | 1 |
| J02.04.01 | Flooding | | | 1 | | 1 | | 1 |
| J02.07.01 | Drainage ditches | | 1 | | 1 | | | 1 |
| K02.01 | Species composition change (succession) | | 1 | | 1 | | | 1 |
| Column Totals | | 9 | 10 | 2 | 9 | 3 | 9 | 21 |

Table 28 Frequency of positive impacts, by intensity and % habitat affected, in the eighteen 6510 sites.

| Impact code | Impact description | Intensity | | | % of the habitat affected | | | No. of sites |
|----------------------|------------------------------|-----------|----------|----------|---------------------------|--------|-----------|--------------|
| | | High | Medium | Low | <25% | 26-75% | >75% | |
| A03.02 | Non-intensive mowing | 14 | 1 | | | | 15 | 15 |
| A04.02.01 | Non-intensive cattle grazing | | | 1 | | | 1 | 1 |
| Column Totals | | 14 | 1 | 1 | | | 16 | 16 |

The notes provided in the rationale column of Table 29 (below) provided information for the monitoring report that was written for each site and is presented in the updated ISGS Access database. Where possible, management recommendations were also included within the monitoring report and these recommendations should be utilised to inform future conservation measures.

Table 29 *Future prospects* (FP) assessment for the eighteen 6510 sites surveyed during the GMS. S&F=Structure & functions, Fav=Favourable, U-I=Unfavourable-Inadequate; U-B=Unfavourable-Bad.

| Site ID | FP of Area | FP of S&F | FP of habitat | Rationale |
|---------|------------|-----------|---------------|---|
| 82 | U-B | U-B | U-B | Negative impact of agricultural intensification |
| 109 | Fav | Fav | Fav | No negative impacts recorded |
| 111 | U-B | U-I | U-B | Negative impact of agricultural intensification |
| 114 | U-B | Fav | U-B | Negative impact of agricultural intensification |
| 850 | Fav | U-B | U-B | Negative impact of supplementary feeders within the 6510 habitat. The impacts of the feeders are greater cattle activity, greater nutrient enrichment, and the feed is a source for <i>Lolium perenne</i> and <i>Trifolium repens</i> seeds |
| 943 | Fav | Fav | Fav | Three stops that failed in 2009 due to high cover of <i>Trifolium repens</i> passed in 2016, although a high cover of <i>T. repens</i> is still an issue within one stop. Due to the positive trend in the S&F and no significant negative impacts, the FP of S&F were judged to be Favourable |
| 1051 | U-B | U-B | U-B | Negative impact of slurry spreading |
| 1087 | U-B | U-B | U-B | Negative impact of agricultural intensification |
| 1248 | Fav | U-I | U-I | One stop failed the S&F assessment due to a high cover of the negative species <i>Trifolium repens</i> |
| 1282 | U-B | U-B | U-B | Negative impact of disturbance due to agricultural show |
| 1696 | Fav | U-I | U-I | One stop failed the S&F assessment due to a high cover of the agricultural species <i>Lolium perenne</i> . However, there is no evidence for agricultural intensification at the site |
| 1697 | Fav | Fav | Fav | No negative impacts recorded |
| 1731 | Fav | U-B | U-B | Negative impacts of slurry spreading and new drains were recorded in 2017. Two stops failed the S&F assessment due to a high cover of the agricultural species <i>Trifolium repens</i> and <i>Lolium perenne</i> , two stops failed the assessment due to a lack of indicator species or a low % forb cover |
| 1733 | U-B | U-B | U-B | Negative impact of agricultural intensification |
| 1735 | Fav | U-B | U-B | Two stops failed the S&F assessment due to a high cover of the agricultural species <i>Trifolium repens</i> |

| Site ID | FP of Area | FP of S&F | FP of habitat | Rationale |
|---------|------------|-----------|---------------|--|
| 1864 | U-I | U-B | U-B | Negative impact of agricultural intensification |
| 2000 | U-B | U-B | U-B | Negative impact of agricultural intensification |
| 2704 | Fav | U-B | U-B | Negative impact of abandonment, with the 6510 habitat not mown in 2016 |

3.4.4 Overall conservation assessment at the site level

The assessments of the individual parameters at each site were combined according to the evaluation matrix in Table 1 to obtain the overall conservation assessment for 6510 habitat at each site. This resulted in two sites receiving a Favourable assessment across the three parameters, three received an Unfavourable-Inadequate assessment, and 13 received an Unfavourable-Bad assessment (Table 30 below).

Table 30 Results of the overall conservation assessment for the eighteen 6510 sites when all three parameters were assessed for the GMS. FP=*Future prospects*, S&F=*Structure & functions*, Fav=Favourable, U-I=Unfavourable-Inadequate; U-B=Unfavourable-Bad.

| Site ID | Site name | Area | S&F | FP | Overall Conservation Status |
|---------|-------------------------------------|------|-----|-----|-----------------------------|
| 82 | Coolderry | U-B | U-B | U-B | U-B |
| 109 | Moystown Demesne and Bullock Island | Fav | Fav | Fav | Fav |
| 111 | Long Island | U-B | U-I | U-B | U-B |
| 114 | Cappaleitrim | U-B | Fav | U-B | U-B |
| 850 | Letterfine | Fav | U-B | U-B | U-B |
| 943 | Derawley | Fav | U-I | Fav | U-I |
| 1051 | Drumcrow | U-B | U-B | U-B | U-B |
| 1087 | Greaghclaugh | U-B | U-B | U-B | U-B |
| 1248 | Rossnowlagh Lower | Fav | U-I | U-I | U-I |
| 1282 | Coolcholly | U-B | U-B | U-B | U-B |
| 1696 | Glencolumbkille South | Fav | U-I | U-I | U-I |
| 1697 | Cream Point | Fav | Fav | Fav | Fav |
| 1731 | Moorbrook | Fav | U-B | U-B | U-B |
| 1733 | Derrygaury | U-B | U-B | U-B | U-B |
| 1735 | Cloongee | Fav | U-B | U-B | U-B |
| 1864 | Knocknageeha | U-I | U-B | U-B | U-B |
| 2000 | Toorlisnamore | U-B | U-B | U-B | U-B |
| 2704 | Aughinish | Fav | U-B | U-B | U-B |

For the eight sites (GMS sites 82 to 1087) surveyed during the baseline ISGS from 2007 to 2009, no baseline overall conservation status was presented in the ISGS Access database due to the lack of *Future prospects* data. For the remaining 10 GMS sites any comparisons made at an individual site level are of a limited value due to significant changes in the assessment methodology and areas surveyed at individual sites, either due to the division of GMS sites into management units (see Section 2.1) or changes in interpretation/refinement of mapping (see Section 2.3.1). During the GMS one of the 10 sites (GMS site 1697) was recorded as having Favourable conservation status, compared with three of

the same 10 sites (GMS site 1248, 1282, and 1735) that were Favourable during the baseline ISGS. Three (GMS site codes 1731, 1733 and 2704) of the 10 sites recorded as Unfavourable-Bad during the ISGS remain Unfavourable-Bad (Table 30).

3.4.5 National assessment of *Future prospects*

Following EU guidance (DG Environment 2017), and using the data collected during the GMS, the following national assessment was made for the *Future prospects* (FP) of the *Area* and *Structure & functions* parameters of the 6510 habitat.

| <i>Area</i> parameter | | | | <i>Structure & functions</i> parameter | | |
|-----------------------|----------------------------------|-----------------------------|-----|--|-----------------------------|-----|
| Habitat | Short-term (12 yrs) future trend | Current conservation status | FP | Short-term (12 yrs) future trend | Current conservation status | FP |
| 6510 | Very negative | Unfavourable-Bad | Bad | Declining | Unfavourable-Bad | Bad |

Area:

- The short-term (i.e., over the next 12 years) future trend for the area of the 6510 habitat is assessed as Very Negative, based on the fact that 28% of the surveyed area was lost during the reporting period. In the short-term future the current pressures, such as agricultural intensification, that are causing these losses in area are expected to continue to threaten the habitat.
- The current conservation status of the *Area* parameter has been assessed as Unfavourable-Bad. For 6510 this is due to the fact that, for the subsample of sites that were surveyed, >1% of the Annex I habitat area has been lost per annum and it is our opinion that the current area is >10% less than the favourable reference area for the habitat nationally.
- The *Future prospects* of the *Area* parameter are therefore assessed as Bad for 6510.

Structure and functions:

- The short-term future trend for the *Structure & functions* of 6510 is assessed as Very Negative as agricultural intensification, abandonment and lack of mowing are currently impacting significantly on ecological processes and are not balanced by effective controls such as conservation actions.
- The current conservation status of the *Structure & functions* parameter for 6510 is Unfavourable-Bad as >25% of the habitat is in unfavourable condition.
- The *Future prospects* of the *Structure & functions* parameter are therefore assessed as Bad for 6510.

The assessments of the individual parameters were combined according to the evaluation matrix in Table 1 to obtain the overall national conservation assessment for the 6510 habitat.

Following the guidelines for habitat assessment at a national level (DG Environment 2017), based on the results presented here and taking into account the area of 6510 with Favourable *Structure & functions* (Table 26 above), the estimated future trends of the habitat's area and *Structure & functions* based on the pressures and threats operating on the habitats and positive management and conservation measures in place, the national Overall Conservation Assessment result for the 6510

habitat is Unfavourable-Bad and the trend is Decreasing. The following data detailed in this report were used to arrive at these results:

- area losses of >1% per annum since the previous monitoring period
- >25% of the surveyed area assessed have Unfavourable-Bad *Structure & functions*;
- major pressures occurring on the Annex I grassland habitats which appear to be impacting significantly on the habitats in the long term.

Table 31 Summary of the national conservation assessment of the 6510 habitat, based on the results of the GMS.

| Parameter | Conservation status | Trend | Future prospects |
|---|-------------------------|-------------------|------------------|
| Area | Unfavourable-Bad | Decreasing | Bad |
| <i>Structure & functions</i> | Unfavourable-Bad | Decreasing | Bad |
| OVERALL NATIONAL CONSERVATION ASSESSMENT | Unfavourable-Bad | Decreasing | Bad |

It should be noted that the data presented above do not include an assessment of the Range parameter; however, as the Area and *Structure & functions* parameters are Unfavourable-Bad and decreasing for each of the three Annex I grassland habitats, the assessment of Range will not change the overall conservation assessment. The Range parameter will be assessed as part of the National Conservation Assessment.

The overall NCA for 6510 is Unfavourable-Bad, as it was when it was previously reported in NPWS (2013). The overall trend has changed from stable, as reported in NPWS (2013), to decreasing and the reason for this change is the 28% of the surveyed area of 6510 reported lost during the GMS, and the significant decline in the number of sites that passed the *Structure & functions* assessment. Previous reports on the status of the 6510 habitat (NPWS 2013; O'Neill *et al.* 2013) only had access to baseline data and were unable to find historical data with which to accurately assess decline in Area and *Structure & functions* due to pressures such as agricultural intensification.

4 Discussion

Discussion of the results collected during the GMS in the context of the ISGS (O'Neill *et al.* 2013) data has proved problematic, primarily because the ISGS was a baseline dataset and the GMS is the first round of actual monitoring data. For the Area parameter this is exhibited in the large differences between the reported areas of habitat lost due to pressures, such as agricultural intensification, during the baseline ISGS data and the GMS. For example, only 9.56ha of 6210/*6210 habitat was recorded as lost within a total surveyed area of 548.40ha during the baseline ISGS, compared with the 108.96ha of 6210/*6210 reported lost within a total area of 346.78ha during the GMS (Table 4). It will be difficult to accurately assess the trend in area loss until data have been collected over several successive monitoring periods. For the *Structure & functions* and the *Future prospects* parameters some assessment of change since the ISGS baseline survey has been possible (see Tables 11, 20 and 29), but due to the fact that the GMS methodology was significantly refined it has proved difficult to make direct comparisons.

A compounding factor in making comparisons between the baseline ISGS and GMS datasets are the impacts of external factors, such as the weather and changing weather patterns and the deposition of atmospheric nitrogen. As reported by Croft and Jeffers (1999) the weather can have a significant effect on grassland species composition and abundance, with the potential to significantly contribute to the variability between monitoring periods (Croft and Jeffers 1999). In Ireland, changes in air temperature (mean annual temperature has increased by 0.8°C over the last 110 years), precipitation (a 5% increase in average annual rainfall in the period 1981 to 2010), and phenology have all been documented (EPA 2016). It is difficult to predict how these changes will influence the species composition of the target Annex I grassland habitats but it is inevitable that changes in precipitation and air temperature will change the species composition. Total nitrogen deposition has been shown to be highest in the east of Ireland (Wilkins and Aherne 2015), which should have a reduced impact on the three target Annex I grassland habitats, as these generally have more central to western distributions. However, for GMS sites with an eastern distribution and an increased chance of nitrogen deposition rates greater than 15 kg ha⁻¹ yr⁻¹, the data presented by Wilkins and Aherne (2015) indicate that the species composition of the three target Annex I grassland habitats will change.

4.1 Conservation status of the target Annex I grassland habitats

The overall National Conservation Assessment (NCA) for the 6210/*6210 habitat is Unfavourable-Bad (Table 13). Within this assessment the Area parameter is Unfavourable-Bad with a decreasing trend and the *Structure & functions* parameter is Unfavourable-Inadequate with a stable trend. The data collected during the GMS indicate that habitat loss is the largest threat to the conservation of the 6210/*6210 habitat, with 31% of the surveyed area of 6210/*6210 reported lost during the GMS due to pressures such as agricultural intensification.

The NCA for the 6410 habitat is Unfavourable-Bad (Table 22). Within this assessment the Area parameter is Unfavourable-Bad with a decreasing trend and the *Structure & functions* parameter is Unfavourable-Bad with a stable trend. The data collected during the GMS indicate that habitat degradation, through pressures such as abandonment, agricultural intensification, and forestry, is the biggest threat to the conservation of the 6410 habitat.

The NCA for the 6510 habitat is Unfavourable-Bad (Table 30). Within this assessment the Area parameter is Unfavourable-Bad with a decreasing trend and the *Structure & functions* parameter is Unfavourable-Bad with a decreasing trend. The data collected during the GMS indicate that the 6510 habitat is the most threatened of the three Annex I grassland habitats studied, with 28% of the surveyed area of 6510 reported lost and a significant decline in the number of sites with Favourable *Structure & functions*: only three sites were reported to have Favourable *Structure & functions* during the GMS, whereas eight of the same 18 sites were reported to have Favourable *Structure & functions* during the baseline ISGS. Pressures such as agricultural intensification and the application of natural fertilisers, such as slurry, are the largest threats to the conservation of the 6510 habitat.

5 Recommendations

The data collected during GMS have shown that the NCAs for all three target Annex I grassland habitats are currently Unfavourable-Bad with a decreasing trend. Therefore, it is important that the future monitoring of the habitats is organised in conjunction with the initiation of conservation measures, such as conservation management plans and targeted agri-environment schemes. The following sections outline measures that aim to halt the decreasing trend for all three Annex I grassland habitats and start to move them towards favourable conservation status.

5.1 Recommended conservation measures

5.1.1 Habitat restoration

All three target Annex I grassland habitats require restoration initiatives to be undertaken for areas of habitat that have been lost or degraded. As resources for restoration are limited, priorities need to be established and the first priority is to restore the target Annex I grassland habitats within the 20 GMS sites that are currently in unfavourable condition and are also listed as a QI within an SAC (Table 32 below).

The first stage of any restoration programme will be to draw up a list of conservation measures that need to be implemented for each of the 20 GMS sites in collaboration with landowners and other stakeholder groups. For SACs with multiple GMS sites and multiple Annex I grassland habitats listed as QIs, such as the River Shannon Callows SAC (site code 000216), it would be advisable to draw up one list of conservation measures for the SAC. It is also important that all conservation measures are considered with reference to the published Conservation Objectives for the SAC.

In addition to site-specific restoration initiatives and conservation measures for QIs within SACs there should also be initiatives with a broader regional or national focus. One such national strategy would be to engage with the meadow initiatives within the All-Ireland Pollinator Plan 2015-20. Also there are templates that can be followed for national initiatives, such as the Save Our Magnificent Meadows project in the UK. Using Co. Fermanagh as a case study, the Save Our Magnificent Meadows project has undertaken key initiatives within the county, including engaging with landowners; the project has engaged with more than 100 farmers in the county and made advisory visits to approximately 4,000ha of farmland, engaging with local communities; story tellers were used to relate memories associated with haymaking, and initiate restoration programmes; 32ha of species-rich lowland meadows in Co. Fermanagh are currently being restored (Anon. 2018).

Within Ireland there are some examples of recently restored meadow sites, such as Castletown House Co. Kildare (GMS site 1499), and such sites should be considered for inclusion within future monitoring programmes. Although the 31.1ha meadow at Castletown House was not Annex I quality when it was surveyed in 2012, if the extensive management regime of annual mowing has been continued, it may have developed the *Structure & functions* of an Annex I 6510 meadow.

Table 32 The 20 GMS sites that are currently in unfavourable condition (U-I=Unfavourable-Inadequate; U-B=Unfavourable-Bad) and where the Annex I grassland habitat is a qualifying interest for the SAC listed.

| Site ID | Site name | Annex I habitat | SAC code | Overall Conservation Status |
|---------|------------------------|-----------------|----------|-----------------------------|
| 1 | All Saints Bog | *6210 | 000566 | U-I |
| 107 | Clonmacnoise | 6410 | 000216 | U-I |
| 110 | Clooncraff | 6410 | 000216 | U-B |
| 111 | Long Island | 6510 | 000216 | U-B |
| 113 | Drumlosh | 6410 | 000216 | U-I |
| 114 | Cappaleitrim | 6510 | 000216 | U-B |
| 802 | Gubacreeny | 6410 | 000428 | U-B |
| 1249 | Drumhome (Lough Birra) | 6410 | 000138 | U-I |
| 1250 | St. John's Point | 6410 | 000191 | U-B |
| 1300 | Glenasmole Valley | 6210 | 001209 | U-I |
| 1541 | Cloonmacduff | 6210 | 001898 | U-B |
| 1541 | Cloonmacduff | 6410 | 001898 | U-B |
| 1556 | Clogher beg | 6210 | 001976 | U-B |
| 1603 | Ballyteige | 6410 | 000994 | U-B |
| 1615 | Lislarheenmore | 6210 | 000020 | U-I |
| 1616 | Keelhilla | 6210 | 001926 | U-B |
| 1617 | Murrooghkilly | *6210 | 000020 | U-I |
| 1696 | Glencolumbkille South | 6510 | 001926 | U-I |
| 2403 | Bunrower | 6410 | 000365 | U-B |
| 2708 | Lacka (World's End) | 6410 | 002165 | U-B |

For some abandoned sites, such as the 6210/*6210 site Manragh Upper Co. Cavan (GMS site 1067), mobile flocks of sheep, often referred to as 'flying flocks', could be utilised to graze the site for short periods each year. Flying flocks are preferable to mobile cattle herds as there are more restrictions placed on the movement of cattle due to foot and mouth. Also for sites where there is no stock-proof fencing or hedges, the use of virtual fencing may need to be investigated. For other sites, changing the timing of grazing could prove crucial in the restoration of the Annex I grassland; for example, sites where *Molinia caerulea* has become abundant, such as Keelhilla Co. Clare (GMS site 1616), should be grazed in the spring when the young more palatable leaves are present (Croft and Jeffers 1999).

It is important to note that generally the objective of grassland conservation is to create a diverse sward (Croft and Jeffers 1999). However, it should be recognised that this can sometimes be at odds with management for Annex I grasslands, where the objective is to manage the area in favourable condition for *Structure & functions*. For example, tussocky areas of *Molinia caerulea* add to the diversity of structure and provide habitat for small mammals and invertebrates (Croft and Jeffers 1999), but such tussocky areas would probably fail the *Structure & functions* assessment due to the dominance of the *Molinia*. Therefore when conservation measures are being developed for areas of Annex I grassland habitat they should consider the impact of the plan on other features such as local fauna. This is particularly important in the case of sites such as Cullahill Mountain SAC (site code 000831)

where 6210/*6210 is a QI but the conservation of a large population of the Annex II species Marsh Fritillary must also be considered within any proposed conservation measures.

5.1.2 Agri-environment schemes

Agri-environment schemes have a key role to play in the conservation of Annex I grassland habitats and in providing the future funding for the conservation measures that will be required for the three target Annex I grassland habitats to attain favourable conservation status nationally. The Department of Agriculture's Green, Low-Carbon, Agri-Environment Scheme (GLAS) aims to achieve Articles 28 and 30 of the Rural Development Regulation and within these broad aims to preserve 'traditional hay meadows and low-input pastures' (Dept. Agri. 2018). Of the 110 sites surveyed during the GMS, one landowner cited GLAS as the reason he had retained species-rich grassland, with the GLAS payment together with savings due to reduced inputs, such as fertiliser, compensating for the sub-optimal yields from the 6510 meadows.

Currently the links between the GMS and farmers is *ad hoc*, reducing the quality of the data the monitoring programme receives from farmers and the relevant data that the monitoring programme could be providing to farmers. Although the GMS did collect some information from informal discussions with farmers and observations made during the site visits, detailed management information on the monitored sites, such as fertiliser applications or stocking densities, was not available, compromising the conservation assessments and any management recommendations that were made.

In addition to a national scheme such as GLAS, more specific agri-environment schemes have also been developed within Ireland to target particular regions, such as the Burren Programme, or particular habitats, such as lowland meadows within the Results-based Agri-environment Pilot Scheme (RBAPS). Both schemes involve significant landowner engagement but it is difficult to quantify the impact of the schemes on the three target Annex I grassland habitats; for the RBAPS this is due to the fact that the scheme was only initiated in 2016, and for the Burren programme the monitoring of Annex I grassland habitats is not a priority for the scheme. It should be noted, however, that both RBAPS and the Burren Programme reported that the conservation measures they have applied have improved the *Structure & functions* for the three target Annex I grassland habitats within some sites covered by the schemes (Dolores Byrne, pers. comm., Sharon Parr, pers. comm.).

It is recommended that for future monitoring programmes a statistically valid subset of GMS sites is selected from areas that are within an agri-environment scheme, to investigate the effectiveness of these schemes in conserving the three target Annex I habitats. The implementation of this recommendation will require more engagement with landowners and the Department of Agriculture than was required during the baseline ISGS or the GMS.

5.2 Recommended refinements to the SAC network and Qualifying Interests

Some of the GMS sites are currently within SACs which do not list one of the target Annex I grassland habitats as a qualifying interest (QI). These SACs should be examined with a view to including either 6210/*6210, 6410 or 6510 on their list of QIs, to accord the habitat the highest level of protection. Table 33 shows those sites where a minimum of 0.25ha of one of the target Annex I habitats was recorded

within an SAC during the GMS but the habitat was not listed as a QI. At a minimum an additional 8.82ha of 6210/*6210, 10.91ha of 6410, and 11.36ha of 6510 habitat could be brought under full protection of the EU Habitats Directive if these additions were to be made to the QIs of the 10 SACs.

Table 33 The area of the target Annex I grassland habitats located within 10 SAC sites where the listed grassland habitat is currently not a Qualifying Interest.

| GMS site | Area 6210/*6210 (ha) | Area 6410 (ha) | Area 6510 (ha) | SAC code |
|----------|----------------------|----------------|----------------|----------|
| 627 | | 2.66 | | 002170 |
| 947 | | 3.55 | | 001818 |
| 1731 | | | 0.83 | 002298 |
| 1735 | | | 8.20 | 002298 |
| 1744 | | 0.7 | | 001899 |
| 1864 | 0.71 | | | 001536 |
| 1865 | 3.95 | | | 000479 |
| 2012 | | 4.00 | | 000440 |
| 2310 | 2.43 | | | 002244 |
| 2345 | 1.73 | | | 002241 |
| 2704 | | | 2.33 | 002165 |
| | 8.82 | 10.91 | 11.36 | |

The inclusion of the 6510 habitat as a QI within the Lower River Shannon SAC (site code 002165) and River Moy SAC (site code 002298) is particularly important as the River Shannon and River Moy are two of the most important areas for the habitat within Ireland. Future efforts to conserve the 6510 habitat within the River Moy callows will be made more difficult by the fact that currently 51% (10.38 ha) of the mapped 6510 habitat (GMS site codes 1731, 1733 and 1735) that has been recorded within the area is outside the SAC network.

5.3 Recommended refinements to future assessment methodology

During the GMS the assessment methodology has been refined to allow the conservation status of individual sites to be efficiently and accurately assessed. However, two areas that need to be developed during the next monitoring period are the strategy for selecting sites for monitoring and improving the level of engagement with landowners.

5.3.1 Selecting sites for sampling

During future monitoring programmes a more scientifically robust sampling strategy will be required to ensure that the Annex I grassland data that are collected accurately reflect the national status of the habitats. Currently the mapped area for the three Annex I habitats within the State is 2,159 ha; 1,416ha of 6210/*6210, 586ha of 6410, and 157ha of 6510 habitat. As the time and resources are not available to monitor all these areas a sampling strategy is required. The sampling strategy utilised during the GMS followed the recommendations detailed in Appendix 2 of O'Neill *et al.* (2013) (see Section 2.1) and was targeted at “primary areas” of Annex I grassland, those areas representing the best examples of each of the three target Annex I grassland habitats. Site selection also broadly aimed to represent the relative abundance of the three target Annex I grasslands. The next round of monitoring should aim to

follow the guidance in DG Environment (2017) on Article 17 sampling to ensure that monitoring sites are chosen based on proven statistical principles such as those summarised in Brus *et al.* (2011).

Five problems with the sampling strategy utilised during the GMS were identified and these should be rectified for the next round of monitoring:

- The “primary areas” of Annex I grassland were selected by O’Neill *et al.* (2013) to ensure that those areas representing the best examples of each of the three target Annex I grassland habitats were monitored and conserved. However, although many of these sites are conservation priorities they are not representative of the habitats nationally. Future monitoring programmes should aim to select sites at random from the national distribution maps that have been developed for each of the target Annex I habitats as part of the GMS project. Site selection should also take into consideration the issues outlined below.
- Although during the GMS a larger number of 6210/*6210 sites and a larger area of this habitat were monitored than for either 6410 or 6510, the habitat was still relatively under-sampled. Future monitoring programmes should aim to sample greater than 25% of the national resource of 6210/*6210.
- The proportion of the monitored area for all three Annex I habitats within the SAC network differed from the proportion of the habitat nationally that is located within the network. For 6210/*6210 a much lower proportion of sites were selected, with 32% of the monitored area within the SAC network compared with 71% nationally. For 6410 and 6510 a much higher proportion was selected: for 6410, 70% of the monitored area was within the SAC network compared with 36% nationally, and for 6510, 57% of the monitored area was within the SAC network compared with 41% nationally. Future monitoring programmes should aim to more accurately reflect the national distribution of the Annex I grassland habitats inside and outside the SAC network.
- The GMS under-sampled from the Burren due to the fact that monitoring data are already collected on the target Annex I grassland habitats within this region by the Burren Programme. However, the data collected by the Burren Programme are currently difficult to access and not fully compatible with the data required for the monitoring of the target Annex I grassland habitats. Future monitoring programmes should aim for increased standardisation of data collection and data storage across different projects.
- Currently the proportion of the monitored area within agri-environment schemes is unknown. Future monitoring programmes should include a subset of GMS sites that are within an agri-environment scheme, to investigate the effectiveness of these schemes in the conservation of the three target Annex I habitats.

5.3.2 Improved landowner engagement

During the GMS there was active landowner engagement resulting in post-survey summary information being sent to 39 of the landowners. Also it should be noted that landowner cooperation with the GMS was good, with access agreed for all but four sites. However, the grassland management data collected during the GMS were gathered on an *ad hoc* basis, based on informal discussions with farmers and from observations recorded on the day of the site visit. Before any effective conservation measures can be developed for the sites listed in Table 32, more detailed

engagement with landowners and other stakeholders is recommended. This would include collecting data on current and future farming practices, including participation in agri-environment schemes. These data could be collected through a combination of techniques including farmer interviews and questionnaires.

The overall goal of favourable conservation status for the 6210/*6210, 6410 and 6510 Annex I grassland habitats within the State will only be achievable by working with landowners and other stakeholders to instigate practical conservation measures.

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Appendix 1

Semi-natural dry grasslands & scrub facies on calcareous substrates (6210); important orchid sites (*6210)

a) Positive species data

The presence/absence of the High quality and Positive indicator species within each 2 m x 2 m monitoring plot should be recorded.

| High Quality Positive Indicator Species | Positive Indicator Species |
|--|--|
| <i>Antennaria dioica</i> | <i>Arabis hirsuta</i> |
| <i>Anthyllis vulneraria</i> | <i>Brachypodium pinnatum</i> |
| <i>Asperula cynanchica</i> | <i>Bromopsis erecta</i> |
| <i>Blackstonia perfoliata</i> | <i>Carex flacca</i> |
| <i>Briza media</i> | <i>Ctenidium molluscum</i> |
| <i>Campanula rotundifolia</i> | <i>Daucus carota</i> |
| <i>Carex caryophylla</i> | <i>Galium verum</i> |
| <i>Carlina vulgaris</i> | <i>Helictotrichon pubescens</i> |
| <i>Centaurea scabiosa</i> | <i>Homalothecium lutescens</i> |
| <i>Filipendula vulgaris</i> | <i>Leontodon hispidus</i> / <i>L. saxatilis</i> (record both but count as one in assessment) |
| <i>Gentiana verna</i> | <i>Lotus corniculatus</i> |
| <i>Gentianella amarella/campestris</i> | <i>Origanum vulgare</i> |
| <i>Geranium sanguineum</i> | <i>Pilosella officinarum</i> |
| <i>Knautia arvensis</i> | <i>Ranunculus bulbosus</i> |
| <i>Koeleria macrantha</i> | <i>Sesleria caerulea</i> |
| <i>Linum catharticum</i> | <i>Thymus polytrichus</i> |
| <i>Primula veris</i> | <i>Trisetum flavescens</i> |
| <i>Sanguisorba minor</i> | |
| Orchid species (record individual orchid species separately) | |

b) High quality and Positive species criteria to assess in the field. Search the surrounding 20 m area if indicator species are failing by 1-2 species.

| Criteria | Scale of assessment |
|--|--------------------------------------|
| High quality and Positive indicator species | |
| Number of High quality species present ≥ 2 | Plot + include 20 m surrounding area |
| Total number of positive indicator and high quality species present ≥ 7 | Plot + include 20 m surrounding area |
| IF positive indicator species are failing consider recording presence/absence of additional positive indicator species. <i>Ditrichum gracile</i> , <i>Hypnum lacunosum</i> , <i>Scapania aspera</i> , and <i>Tortella tortuosa</i> can be included as +ve indicator species for upland 6210. | |

c) Negative indicator species data

% cover of negative indicator species and non-native species to be recorded using the scale of 0.1%, 0.3%, 0.5%, 0.7%, 1%, 3%, 5%, 7%, 10%, and then to the nearest 5%

| Negative indicator species | Any non-native species should be recorded (e.g. <i>Campylopus introflexus</i> , <i>Crepis vesicaria</i> , <i>Epilobium brunnescens</i> , <i>Sedum album</i>) |
|------------------------------|---|
| <i>Arrhenatherum elatius</i> | |
| <i>Cirsium arvense</i> | |
| <i>Cirsium vulgare</i> | |
| <i>Dactylis glomerata</i> | |
| <i>Lolium perenne</i> | |
| <i>Rumex crispus</i> | |
| <i>Rumex obtusifolius</i> | |
| <i>Senecio jacobaea</i> | |
| <i>Trifolium repens</i> | |

| | |
|----------------------|--|
| <i>Urtica dioica</i> | |
|----------------------|--|

d) Header data (recorded using the same % cover scale as listed above for negative species)

| Negative species | Scale |
|--|----------------|
| Record the % collective cover of scrub, bracken and heath (woody species) (Pass ≤ 5%) | Plot |
| Record the % collective cover of the above negative indicator species (Pass ≤ 20%) | Plot |
| Vegetation structure | |
| % forb cover | Plot |
| % graminoid cover | Plot |
| Record % cover of litter (Pass ≤ 25%) | Plot |
| Record Y or N, for if the proportion of the sward between 5-40 cm tall is ≥ 30% | Plot |
| Physical structure | |
| Record the % cover of bare soil (Pass ≤ 10%) | Plot |
| Record Y or N, for if the area of the habitat showing signs of serious <u>grazing</u> or <u>disturbance</u> is < 20 m ² | Local vicinity |

***Molinia* meadows on calcareous, peaty or clayey-silt laden soils (Molinion caeruleae) (6410)**

a) Positive species data

The presence/absence of the High quality and Positive indicator species within each 2 m x 2 m monitoring plot should be recorded.

| High Quality Positive Indicator Species | Positive Indicator Species |
|---|--|
| <i>Carex pulicaris</i> | <i>Achillea ptarmica</i> |
| <i>Carum verticillatum</i> | <i>Carex echinata</i> |
| <i>Cirsium dissectum</i> | <i>Carex flacca</i> |
| <i>Crepis paludosa</i> | <i>Carex nigra</i> |
| <i>Galium uliginosum</i> | <i>Carex panicea</i> |
| <i>Juncus conglomeratus</i> | <i>Carex viridula</i> |
| <i>Lathyrus palustris</i> | <i>Equisetum palustre</i> |
| <i>Ophioglossum vulgatum</i> | <i>Filipendula ulmaria</i> |
| <i>Viola persicifolia</i> | <i>Galium palustre</i> |
| Orchid species (record individual orchid species separately) | <i>Juncus acutiflorus</i> / <i>J. articulatus</i> (record both but count as one in assessment) |
| | <i>Lotus pedunculatus</i> |
| | <i>Luzula multiflora</i> |
| | <i>Mentha aquatica</i> |
| | <i>Molinia caerulea</i> (Pass = Present in one plot or within 20 m of a plot) |
| | <i>Potentilla anglica</i> |
| | <i>Potentilla erecta</i> |
| | <i>Ranunculus flammula</i> |
| | <i>Succisa pratensis</i> |
| | <i>Viola palustris</i> |

b) High quality and Positive species criteria to assess in the field. Search the surrounding 20 m area if indicator species are failing by 1-2 species.

| Criteria | Scale of assessment |
|--|--------------------------------------|
| High quality and Positive indicator species | |
| Number of high quality species present ≥ 1 | Plot + include 20 m surrounding area |
| Total number of positive indicator and high quality species present ≥ 7 | Plot + include 20 m surrounding area |
| IF positive indicator species are failing consider recording presence/absence of additional positive indicator species. For example, <i>Hydrocotyle vulgaris</i> can be included as a +ve indicator species for fen 6410 and <i>Rhinanthus minor</i> can be included as a +ve indicator species for meadow 6410. | |

c) Negative indicator species data

% cover of **negative indicator species** and **non-native species** to be recorded using the scale of 0.1%, 0.3%, 0.5%, 0.7%, 1%, 3%, 5%, 7%, 10%, and then to the nearest 5%

| Negative Indicator species | Any non-native species should be recorded (e.g. <i>Campylopus introflexus</i> , <i>Crepis vesicaria</i> , <i>Epilobium brunnescens</i>) |
|-----------------------------|--|
| <i>Cirsium arvense</i> | |
| <i>Cirsium vulgare</i> | |
| <i>Glyceria maxima</i> | |
| <i>Lolium perenne</i> | |
| <i>Phalaris arundinacea</i> | |
| <i>Phragmites australis</i> | |
| <i>Polytrichum</i> spp. | |
| <i>Rumex crispus</i> | |
| <i>Rumex obtusifolius</i> | |
| <i>Senecio jacobaea</i> | |
| <i>Trifolium repens</i> | |
| <i>Urtica dioica</i> | |

d) Header data (recorded using the same % cover scale as listed above for negative species)

| Negative species | Scale |
|--|----------------|
| Record the % collective cover of scrub, bracken and heath (woody species) (Pass ≤ 5%) | Plot |
| Record the % collective cover of the above negative indicator species (Pass ≤ 20%) | Plot |
| Record the % cover of <i>Polytrichum</i> species (Pass ≤ 25%) | Plot |
| Vegetation structure | |
| % forb cover | Plot |
| % graminoid cover | Plot |
| Record % cover of litter (Pass ≤ 25%) | Plot |
| Record Y or N, for if the proportion of the sward between 10-80 cm tall is ≥ 30% | Plot |
| Physical structure | |
| Record the % cover of bare soil (Pass ≤ 10%) | Plot |
| Record Y or N, for if the area of the habitat showing signs of serious <u>grazing</u> or <u>disturbance</u> is < 20 m ² | Local vicinity |

Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*) (6510)**a) Positive species data**

The presence/absence of the High quality and Positive indicator species within each 2 m x 2 m monitoring plot should be recorded.

| High Quality Positive Indicator Species | Positive Indicator Species |
|---|------------------------------|
| <i>Bromus racemosus</i> | <i>Alopecurus pratensis</i> |
| <i>Hordeum secalinum</i> | <i>Centaurea nigra</i> |
| <i>Knautia arvensis</i> | <i>Crepis capillaris</i> |
| <i>Leucanthemum vulgare</i> | <i>Daucus carota</i> |
| <i>Lotus corniculatus</i> | <i>Filipendula ulmaria</i> |
| <i>Pimpinella major</i> | <i>Heracleum sphondylium</i> |
| <i>Rhinanthus minor</i> | <i>Hypochaeris radicata</i> |
| <i>Sanguisorba officinalis</i> | <i>Lathyrus pratensis</i> |
| <i>Tragopogon pratensis</i> | <i>Leontodon autumnalis</i> |
| Orchid species (record individual orchid species separately) | <i>Leontodon hispidus</i> |
| | <i>Plantago lanceolata</i> |
| | <i>Prunella vulgaris</i> |
| | <i>Ranunculus acris</i> |
| | <i>Trifolium pratense</i> |
| | <i>Trisetum flavescens</i> |

| | |
|--|---------------------|
| | <i>Vicia cracca</i> |
|--|---------------------|

- b) **High quality and Positive species criteria to assess in the field.** Only search the surrounding 20 m area if indicator species are failing by 1-2 species.

| Criteria | Scale of assessment |
|--|--------------------------------------|
| High quality and Positive indicator species | |
| Number of high quality species present ≥ 1 | Plot + include 20 m surrounding area |
| Total number of positive indicator and high quality species present ≥ 7 | Plot + include 20 m surrounding area |
| IF positive indicator species are failing consider recording presence/absence of additional positive indicator species. For example, <i>Juncus acutiflorus</i> can be included as a +ve indicator species for wetter 6510 communities. | |

- c) **Negative indicator species data**

% cover of **negative indicator species** and **non-native species** to be recorded using the scale of 0.1%, 0.3%, 0.5%, 0.7%, 1%, 3%, 5%, 7%, 10%, and then to the nearest 5%

| Negative Indicator species | Any non-native species should be recorded (e.g. <i>Crepis vesicaria</i> and <i>Sanguisorba minor</i> subsp. <i>muricata</i>) |
|------------------------------|---|
| <i>Arrhenatherum elatius</i> | |
| <i>Cirsium arvense</i> | |
| <i>Cirsium vulgare</i> | |
| <i>Dactylis glomerata</i> | |
| <i>Lolium perenne</i> | |
| <i>Rumex crispus</i> | |
| <i>Rumex obtusifolius</i> | |
| <i>Senecio jacobaea</i> | |
| <i>Trifolium repens</i> | |
| <i>Urtica dioica</i> | |

- d) **Header data** (recorded using the same % cover scale as listed above for negative species)

| Negative species | Scale |
|---|----------------|
| Record the % collective cover of scrub, bracken and heath (woody species) (Pass $\leq 5\%$) | Plot |
| Record the % collective cover of the above negative indicator species (Pass $\leq 20\%$) | Plot |
| Vegetation structure | |
| % forb cover | Plot |
| % graminoid cover | Plot |
| Record % cover of litter (Pass $\leq 25\%$) | Plot |
| Record Y or N, for if the proportion of the sward between 10-50 cm tall is $\geq 50\%$ | Plot |
| Physical structure | |
| Record the % cover of bare soil (Pass $\leq 10\%$) | Plot |
| Record Y or N, for if the area of the habitat showing signs of serious <u>grazing</u> or <u>disturbance</u> is $< 20 \text{ m}^2$ | Local vicinity |

