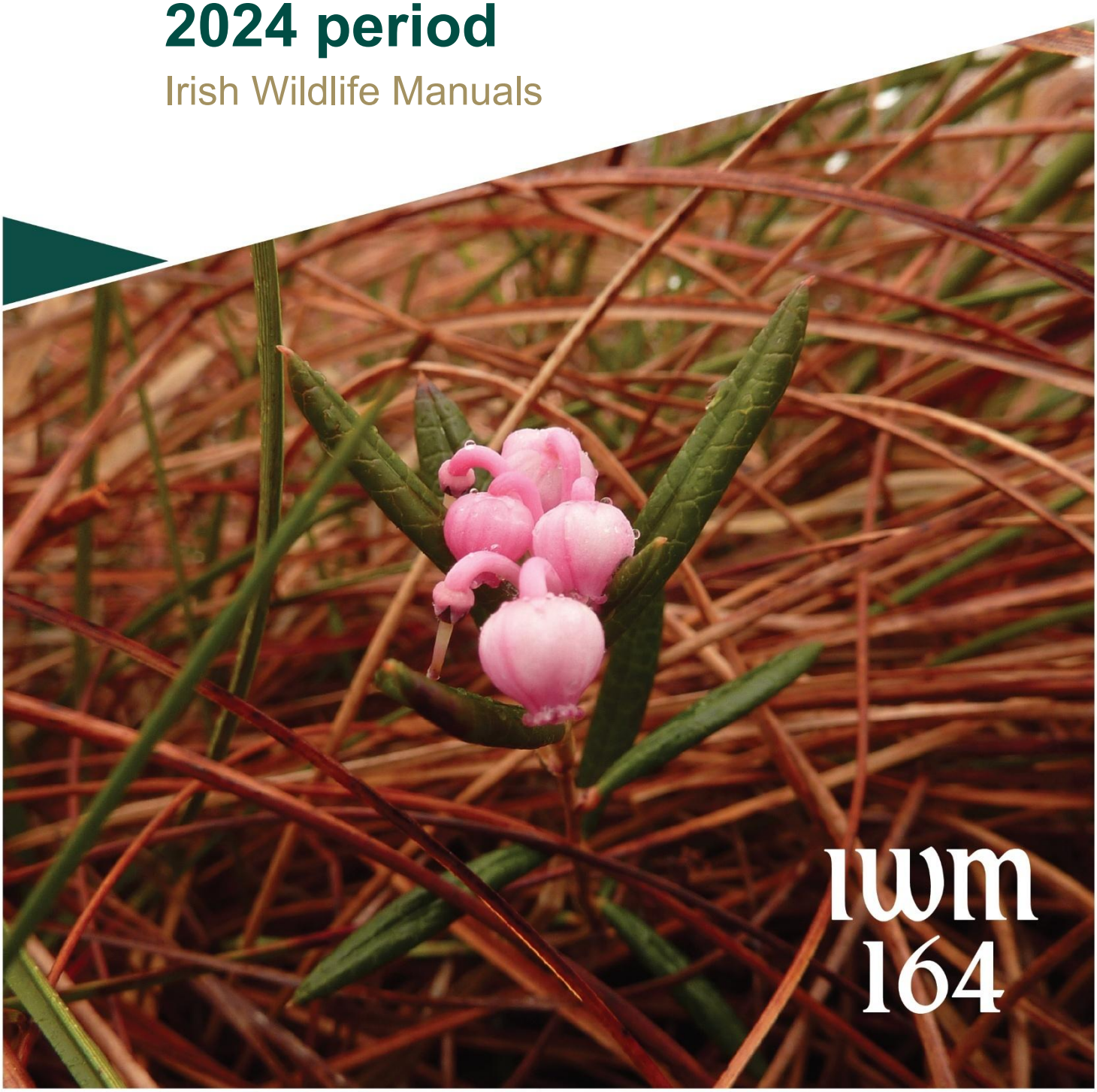
NPWS

An tSeirbhís Páirceanna
Náisiúnta agus Fiadhúlra
National Parks and Wildlife Service

Active and degraded raised bog conservation status assessment for the 2019-2024 period

Irish Wildlife Manuals



IWM 164

Citation: Crushell, P., Crowley, W., Delaney, E., Denyer, J., Fernandez, F., Foss, P., Gallagher, M.C., O'Sullivan, J., Overy, P., Smith, G.F. & Vanmechelen, A. (2026). Active and Degraded raised bog conservation status assessment for the 2019-2024 period. Irish Wildlife Manuals, No. 164. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.

Keywords: Active raised bog, conservation status, Degraded raised bog, Ireland, raised bog, 7110, 7120.

The National Parks and Wildlife Service (NPWS) undertakes scientific research to assist it in its mission to protect nature, both internally and by commissioning a range of reports from external contractors. The Irish Wildlife Manuals (IWM) series serves as a record of this work and is one way in which the NPWS Scientific Advice and Research Directorate disseminates scientific information, along with others such as publications in peer-reviewed journals. The views and recommendations presented in this report are not necessarily those of NPWS and should not be attributed to NPWS.

Front cover photograph: Bog Rosemary *Andromeda polifolia* and Common Cottongrass *Eriophorum angustifolium,* Raheenmore Bog SAC (000582), Co. Offaly, Fernando Fernandez.

Active and degraded raised bog conservation assessment for the 2019-2024 period

Patrick Crushell[1], William Crowley[1], Eamonn Delaney[2], Joanne Denyer[3], Fernando Fernandez[4], Peter Foss[5], Mary Catherine Gallagher[1], Joseph O'Sullivan[1], Poppy Overy[1], George F. Smith[6] & Adam Vanmechelen[1]

[1]Wetland Surveys Ireland Ltd., Kenmare, Co. Kerry; [2]Delichon Ecology Ltd, Headford, Galway; [3]Denyer Ecology, Dublin 16; [4]National Parks and Wildlife Service, Dublin 7; [5]Foss Environmental, Dublin 24; [6]Blackthorn Ecology, Moate, Co. Westmeath.

The NPWS Project Officer for this report was Fernando Fernandez; Fernando.Fernandez@npws.gov.ie

Associated project resource code: 0401_RBMP21
This IWM was edited by Sue Wilson, Fionn Ó Marcaigh & Hannah Mulcahy.

ISSN 1393 – 6670
© An tSeirbhís Páirceanna Náisiúnta agus Fiadhúlra 2026
© National Parks and Wildlife Service 2026
An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
90 Sráid an Rí Thuaidh, Baile Átha Cliath 7, D07 N7CV
Department of Housing, Local Government and Heritage
90 North King Street, Dublin 7, D07 N7CV

Table of Contents

Executive Summary i
Acknowledgments ii
1 Introduction 1
1.1 Raised bog habitats 1
1.1.1 Annex I raised bog habitats 1
1.1.2 Mapping high bog ecotopes 2
1.1.3 Mapping cutover habitats 3
1.2 Article 17 Reporting 3
1.3 Strategic peatland management, conservation plans and policies 4
1.4 Multi-Annual Raised Bog Monitoring Programme (MARBMP) 2021-24 6
2 Methods 7
2.1 Estimating the national ARB extent 7
2.1.1 Habitat area 7
2.1.1.1 Ecotope surveys 7
2.1.1.2 Walkover Surveys 8
2.1.1.3 Desktop analysis of aerial imagery 8
2.1.1.4 Cutover Surveys 9
2.1.1.5 Other data 9
2.1.2 National ARB habitat distribution and range maps 9
2.2 National DRB habitat distribution and Range maps 10
2.3 Pressures and Threats 11
2.4 Conservation Measures 11
2.5 Conservation status assessment 12
2.5.1 Conservation status assessment general methods 12
2.5.1.1 Range 14
2.5.1.2 Area 15
2.5.1.3 Structure and Functions 15
2.5.1.4 Future Prospects 16
2.5.1.5 Overall assessment of conservation status 17
2.5.1.6 NATURA 2000 coverage for Annex I habitat types 17
2.5.2 Active Raised Bog conservation status assessment 17
2.5.3 Degraded Raised Bog conservation status assessment 19
3 Results 21
3.1 ARB habitat mapping 21
3.1.1 Habitat area 21
3.1.1.1 Ecotope surveys during the reporting period 21
3.1.1.2 Walkover surveys during the reporting period 22
3.1.1.3 Cutover surveys during the reporting period 22
3.1.1.4 Desktop analysis of old data during the reporting period 22

3.1.1.5 Other data 22
3.1.2 Habitat distribution 24
3.1.3 Habitat Range 25
3.1.4 Habitat Favourable Reference Range 25
3.2 DRB habitat mapping 27
3.2.1 Habitat distribution 27
3.2.2 Habitat Range 27
3.2.3 Habitat Favourable Reference Range 27
3.3 Pressures and threats assessment 29
3.3.1 PC05 Peat extraction (includes associated drainage) 30
3.3.1.1 Turf cutting 30
3.3.1.2 Associated drainage 31
3.3.2 PL02 Drainage 33
3.3.3 PK04 Atmospheric Nitrogen Deposition 33
3.3.4 PB Forestry 36
3.3.4.1 PB01 Conversion to forest from other land uses, or afforestation (excluding drainage) 36
3.3.4.2 PB24 Drainage for forestry 37
3.3.5 PA22 Drainage for use as agricultural land 37
3.3.6 PJ Climate Change 38
3.3.7 PH08 Other human intrusions and disturbance (burning) 39
3.3.8 PI02 Other invasive alien species (other than species of Union concern) 39
3.3.9 PI03 Problematic native species 40
3.3.10 Other impacting activities 40
3.4 Conservation Measures 41
3.4.1 MC02 Adapt/manage exploitation of energy resources (control of turf cutting and development of restoration plans) 42
3.4.2 MC07 Habitat restoration/creation from resources, exploitation areas (drain blocking) 43
3.4.3 MK03 Restoration of habitats impacted by multi-purpose hydrological changes (enhanced restoration measures) 45
3.4.4 MB14 Manage drainage and water abstraction for forestry (conifer plantation removal and restoration of drained areas) 46
3.4.5 MI03 Management, control or eradication of other invasive alien species 47
3.4.6 MA13 Manage agricultural drainage and water abstraction (incl. the restoration of drained or hydrologically altered habitats) 48
3.4.7 MA14 Other measures related to agricultural practices 49
4 Conservation status assessment 51
4.1 Active Raised Bog conservation status assessment 51
4.1.1 Range 51

4.1.2 Area 52
4.1.3 Structure and Functions 56
4.1.3.1 Extent of ARB in good condition 57
4.1.4 Future Prospects 58
4.1.4.1 FP of Range 60
4.1.4.2 FP of Area 60
4.1.4.3 FP of Structure and Functions 60
4.1.4.4 Overall FP 60
4.1.5 Overall Conservation Status Assessment 61
4.1.6 NATURA 2000 coverage and condition 62
4.1.6.1 Extent of ARB within SACs 62
4.1.6.2 Surface area in good condition in SACs 62
4.1.6.3 Structure and Functions of ARB in SACs 63
4.2 Degraded Raised Bog conservation status assessment 63
4.2.1 Range 63
4.2.2 Area 63
4.2.3 Structure and Functions 64
4.2.4 Future Prospects 65
4.2.4.1 FP of Range 65
4.2.4.2 FP of Area 65
4.2.4.3 FP of Structure and Functions 65
4.2.4.4 Overall FP 65
4.2.5 Overall conservation status assessment 66
4.2.6 NATURA 2000 coverage and condition 66
4.2.6.1 Extent of DRB within SACs 66
4.2.6.2 Surface area in good condition in SACs 66
4.2.6.3 Structure and Functions of DRB in SACs 66
5 Discussion 68
6 Recommendations 68
7 References 70
Appendix 1 Deliverables under MARBMP 2021-24 74
Appendix 2 Spatial datasets updated or created as part of the assessment 74
Appendix 3 Ecotope and Community Complex Key 76
Appendix 4 Community Complex descriptions 80
Appendix 5 Ecotope surveys undertaken 2019-24 98
Appendix 6 Walkover surveys undertaken 2019-24 100
Appendix 7 Sites assessed with aerial imagery 101
Appendix 8 ARB on cutover 111
Appendix 9 Assessment of the ranking of Pressures/Threats on ARB at site level 112
Appendix 10 Assessment of the ranking of Conservation Measures on ARB at site level 118

Appendix 11 Ecotope data from 2010-18 used in estimating national ARB extent..122
Appendix 12 Pressures/Threats ranked by site 124
Appendix 13 Examples of High bog drainage inserted on non-designated sites during the reporting period 126
Appendix 14 Lengths of drains blocked within SACs 128
Appendix 15 Lengths of drains blocked within NHAs proposed for retention 130
Appendix 16 Forestry that is proposed to be removed from within designated sites by restoration plans.....131
Appendix 17 Conservation Measures ranked by site 132
Appendix 18 Summary of the progress of implementation of proposed hydrological restoration measures across the 55 SACs designated for ARB and the additional seven designated for DRB.....134
Appendix 19 Summary of the progress of implementation of proposed hydrological restoration measures across the NHA network proposed for retention 136
Appendix 20 Deep-peat Bord na Móna bogs where restoration works have been undertaken 137
Appendix 21 Lengths of bunding built within SACs 139
Appendix 22 Lengths of bunding built within NHAs proposed for retention 140
Appendix 23 CCA for Area and S&F and overall.....141
Appendix 24 CCA for Future Prospects 142

Executive Summary

This document assesses the conservation status of Active Raised Bogs (ARB; Annex I code 7110) and Degraded Raised Bogs still capable of natural regeneration (DRB; code 7120). These two habitats are intimately linked with the conservation goal being to restore all DRB to ARB. Ireland's conservation network includes 55 Special Areas of Conservation (SACs) with ARB listed as a qualifying interest (QI) and an additional seven sites with DRB listed as a QI. In addition, Ireland's Natural Heritage Area (NHA) network will comprise 61 raised bog sites once its reconfiguration is concluded.

From 2019-24, the conservation condition of 46 bogs across 36 sites (21 SACs, 13 NHAs and two proposed NHAs) was assessed through ground surveys, ecotope mapping and appraisals of Conservation Measures and the pressures and threats facing each bog. Additionally, a review of the national dataset of known ARB and DRB was undertaken.

Both ARB and DRB are assessed as Unfavourable Bad - Improving for the reporting period, reflecting the first net gain in ARB extent since Article 17 reporting began. Parameter-level assessments are: Range: Unfavourable Bad - Stable; Area: Unfavourable Bad - Increasing: the extent of ARB in Ireland in 2024 estimated at 1,843ha, a *c.* 122 ha / 7.1% increase since 2018 and Structure and Functions (S&F): Unfavourable Bad - Improving. Future Prospects (FP) are Bad for Range as it is expected to remain stable but below Favourable Reference Value (FRV) over the next two reporting periods and Poor for Area and S&F as both are expected to improve but remain below their FRVs.

The main reason for the increase is the extensive amount of restoration works undertaken through the NPWS National Raised Bog Restoration Programme and BnM's restoration projects. ARB increased by 17 ha in SACs and 8 ha in NHAs proposed for retention. Despite the overall increase, decreases were estimated within 12 of the 62 SACs (19%) and two of the 36 NHAs proposed for retention (6%). These decreases were mainly due to turf cutting and associated drainage.

All 46 bogs assessed were in Unfavourable Bad overall conservation condition. Overall trends were improving at 12 bogs (26%), stable at 12 (26%) and declining at 22 (48%). Within two reporting periods, one bog (2%) is expected to reach Favourable condition, five (11%) to reach Unfavourable Inadequate, and 40 (87%) to remain Unfavourable Bad. For Area, two bogs were assessed as Unfavourable Inadequate and 44 as Unfavourable Bad. Area increased at 18 bogs (39%), decreased at ten (22%) and remained stable at 18 (39%). For S&F, all 46 bogs were Unfavourable Bad. S&F improved at 12 bogs (26%), remained stable at 13 (28%) and declined at 21 (46%). The differences between Area and S&F trends partly reflect the longer time required to restore good-quality ARB.

The two largest pressures on ARB and DRB were turf cutting, including associated drainage, and drainage in general. Although turf cutting is ongoing in 2024 at 26% of the 62 raised bog SACs, a decreasing trend is evident. Comparing the periods 2013-18 and 2019-24, the average number of SACs cut annually fell by 35.5%, from 25.3 to 16.3 while the average number of plots cut within SACs fell 15.5%, from 312.8 to 264.2. In 2024, fewer than 200 plots (185) were cut within SACs for the first time, with a further significant fall expected in 2025. Cutting also declined on NHAs proposed for retention, although exact figures are not yet available. It occurred on 13 of these 36% sites from 2019-24, down from 21 in 2013-18 (a 38% reduction). Analysis of aerial imagery indicates that there has been little or no change in cutting activities on sites proposed for designation as NHAs, NHAs proposed for de-designation or on non-designated sites, with a very high intensity of cutting ongoing on some sites. Positive developments include BnM ending peat harvesting; the 2021–26 Enhanced

Decommissioning, Rehabilitation and Restoration Scheme (EDRRS) for harvested peatlands; and Environmental Protection Agency (EPA) action to halt commercial peat harvesting.

Drainage is the next most significant pressure. Of 3,617 km of drains requiring blocking to meet ARB targets on SACs and retained NHAs, 1,566 km (43%) had been blocked by November 2024. Other pressures include forestry, burning, invasive species and problematic native species.

ARB and DRB face growing pressure from nitrogen concentration and deposition, climate change and agricultural drainage, with further analysis of these threats required. Over 90% of Ireland's raised bog SACs exceed modelled Critical Levels for atmospheric ammonia, with agriculture the likely main source. Of 46 assessed bogs, nitrogen impacts exerted high pressure on four (9%) and medium pressure on 19 (41%). In terms of agricultural drainage (agricultural-related drainage on land adjacent to the bogs), ARB and DRB were assessed as being under a high pressure on three of the 46 bogs (7%) and medium pressure on seven (15%).

Restoration plans were prepared for all 62 raised bog SACs and 36 NHAs proposed for retention, with substantial implementation progress. By November 2024, hydrological restoration works had been completed on 28.5% of SAC areas and 22.8% of retained NHA areas, amounting to 27.2% in total across both networks. Works undertaken during the reporting period included blocking 525 km of drains and the construction of 109 km of bunds. The most frequent management action has been the control of turf cutting, which has had a positive impact on all 46 bogs assessed.

Overall FP is Bad because Range FP is Bad. Although ARB extent and S&F are expected to improve over the next two reporting periods, their FP remains Poor because FRVs are unlikely to be achieved. This reflects ongoing pressures and threats both within and outside designated sites, as well as practical barriers to delivering the national restoration ambition, such as fragmented land ownership and untraceable landowners. Addressing these issues while continuing the National Raised Bog Restoration Programme could substantially improve FP. Recommendations to support this improvement are provided at the end of the report.

Acknowledgments

The work has been funded by the NPWS (Department of Housing, Local Government and Heritage).

We appreciate input from everyone involved in different ways in this project with special thanks to NPWS including staff from the scientific unit and regional staff.

The BnM ecology team (particularly Mark McCorry, Oliver McGlinchey, Mark Anca, David McNicholas, Patricia Kieran and Sheila Kelly) were very helpful in supplying data and discussions on reporting. Hugh Cushnan and Francis Mackin of RPS TetraTech Consultants also helped greatly on these tasks. Thanks also to Coillte particularly Janice Fuller for supplying data on Coillte sites. Collaboration with UCD and the EPA as part of the NEMN project was aided by Thomas Cummins, Yvonne English, Lorna Marcham and David Kelleghan. Thanks also to Barry O'Loughlin for providing additional information and data.

Finally, we thank the many landowners and turbary right holders for facilitating access to the sites during surveys.

1 Introduction

1.1 Raised bog habitats

Raised bogs once covered an estimated 310,000 ha of Ireland (Hammond, 1979). However, traditional cutting of bogs over the last 400 years had a serious impact and no fully intact bog now remains. Exploitation of bogs was accelerated in the second half of the 20th century with the mechanisation of turf cutting. The rate of loss of raised bogs resulted in the creation of various conservation initiatives to reverse this trend.

1.1.1 Annex I raised bog habitats

Four habitat types listed under Annex I of the Habitats Directive (92/43/EEC) are typically associated with raised bogs in Ireland, two of which are priority habitats:

1. 7110, Active raised bogs (priority habitat) (ARB)
2. 7120, Degraded raised bogs still capable of natural regeneration (DRB)
3. 7150, Depressions on peat substrates of the *Rhynchosporion*
4. 91D0, Bog Woodland (priority habitat)

The scope of this report deals only with the first two habitats listed above, ARB and DRB as the latter two habitats are not restricted to raised bogs.

The interpretation manual of EU habitats (CEC, 2013) gives the following description for ‘active raised bogs’:

> *Acid bogs, ombrotrophic, poor in mineral nutrients, sustained mainly by rainwater, with a water level generally higher than the surrounding water table, with perennial vegetation dominated by colourful Sphagna hummocks allowing for the growth of the bog (Erico-Sphagnetalia magellanici, Scheuchzerietalia palustris p., Utricularietalia intermedio-minoris p., Caricetalia fuscae p.). The term "active" must be taken to mean still supporting a significant area of vegetation that is normally peat forming, but bogs where active peat formation is temporarily at a standstill, such as after a fire or during a natural climatic cycle e.g., a period of drought, are also included.*

ARB comprises the wettest and least damaged vegetation on a raised bog, and is an extremely important habitat as it is severely threatened and in danger of disappearance, owing to the rate and extent of loss over the past number of decades (Mackin *et al*., 2017a). It is characterised by the presence of a surface vegetation layer or acrotelm, which is defined as the living, actively growing upper layer of a raised bog within which the water table fluctuates. Vegetation in the acrotelm is composed mainly of living bog mosses (*Sphagnum* species). In Ireland, the identification of ARB is made at ecotope level on the high bog and at habitat level on the cutover as discussed in following sections.

‘Degraded raised bogs’ are defined by the interpretation manual of EU habitats (CEC, 2013) as follows:

> *These are raised bogs where there has been disruption (usually anthropogenic) to the natural hydrology of the peat body, leading to surface desiccation and/or species change or loss. Vegetation on these sites usually contains species typical of active raised bog as the main component, but the relative abundance of individual species is different. Sites judged to be still capable of natural regeneration will include those areas where the hydrology*

can be repaired and where, with appropriate rehabilitation management, there is a reasonable expectation of re-establishing vegetation with peat-forming capability within 30 years.

1.1.2 Mapping high bog ecotopes

When mapping habitats in Ireland, the Heritage Council's *A Guide to Habitats in Ireland* (Fossitt, 2000) is the standard used in general ecological surveys, be it in relation to landuse planning or conservation programmes (Smith *et al*., 2011). However, this classes all intact high bog together (as PB1 Raised bog) regardless of whether it is currently peat-forming or not, and separately classes all cutover raised bog together with cutover blanket bog (as PB4 Cutover bog) regardless of whether it is currently peat-forming or not. This broad habitat classification has limitations when mapping peat-forming areas that correspond to bog habitats listed in Annex I of the Habitats Directive (92/43/EEC), namely the priority habitat ARB (priority Annex habitat 7110) and DRB (Annex habitat 7120).

A more refined mapping system of ecotope classification is used to identify areas that correspond to ARB while eco-hydrological modelling is used to identify areas that conform to DRB (*i.e*. degraded bog which has the potential to be restored to ARB). Ecotope classification involves grouping and boundary mapping plant community complexes into a number of distinct ecotopes. Each ecotope has a distinct set of community complexes (homogenous mosaics of stands of different vegetation community types). In addition, each ecotope has a typical associated acrotelm depth and hydrological and hydro-chemical characteristics (see Kelly and Schouten, 2002 and Fernandez *et al*., 2014 for further details). The basic system is based on an idealised concentric approach from the centre and wettest part of a high bog, to the driest occurring at the margin. However, because of subsidence this concentric pattern of ecotopes no longer occurs across many sites. Nonetheless, the characteristics of each ecotope remain, but now exist in a different pattern across the high bog.

The main concentric type ecotopes range from central (typically the wettest and indicative of excellent quality ARB), through to sub-central (also ARB), sub-marginal, marginal and facebank (which is the driest ecotope type and typically occurs along the margin of a raised bog). Actively accumulating peat conditions (forming ARB) occur within the sub-central and central ecotopes only. The other three ecotopes typically have a supporting function for the central and sub-central communities but are not themselves peat accumulating. Further ecotope types exist outside of the concentric system, namely flushes, soaks and bog woodland. These can be either active flushes (*i.e*. peat-forming and thus ARB) or inactive flushes. Bog woodland can either be *Sphagnum*-rich (and conform to the priority Annex habitat 91D0) or *Sphagnum*-poor. The former is classed as ARB when it occurs on high bog while the latter is not. Ecotopes that are not classed as ARB are an essential part of the hydrological unit which supports the ARB habitat. Repeat ecotope mapping over time allows even small changes in habitat quality to be measured.

To help identify DRB, an eco-hydrological model has been developed based on the use of LiDAR (Light Detection and Ranging) technology (see NPWS, 2017). This model can predict where there is potential to restore ARB on the high bog and peat-forming conditions on the cutover. Only these areas, which have the right combination of physical conditions (including surface shape, slope and drainage patterns), are capable of supporting ARB. Where these conditions exist on the high bog and ARB is not currently present, the area is now considered to be DRB. There is no consistent, direct relationship between non-active ecotopes and the areas

identified as DRB by the model (that is, areas of marginal or sub-marginal ecotope may or may not correspond with DRB).

1.1.3 Mapping cutover habitats

The ecotope classification scheme is applicable on the high bog only and does not apply to cutover bog. This is largely because cutover bog is such a variable habitat that has formed because of historical anthropogenic impacts. The variability of the habitat is determined by such factors as the frequency and extent of disturbance, hydrology, the depth and nature of the peat remaining and the underlying substratum (Fossitt, 2000). Up until this reporting period ARB was defined as occurring only on the high bog in Ireland. However, a growing acknowledgement of the occurrence of peat-forming vegetation on some cutovers led to an appraisal of these habitats and to the development by Smith & Crowley (2020) of a specific habitat classification for cutover raised bog. This classification firstly separates habitats into four broad groups defined by the percentage cover of *Sphagnum* and/or bare peat present: Bare Peat (BP), Low *Sphagnum* (LS), Moderate *Sphagnum* (MS) and High *Sphagnum* (HS). These then encompass sixteen habitat types that are defined using species composition. Only the HS habitat type potentially corresponds to ARB. Smith & Crowley developed a method for assessing whether such areas correspond to ARB. This is based largely on the number of positive indicator species present and a lack of cover of species not typical of ombrotrophic raised bog. In general, regenerating ombrotrophic vegetation on cutover even where it corresponds with ARB, can lack the diversity of *Sphagnum* species, micro-topographical features and good quality indicators that are associated with the highest quality ARB.

1.2 Article 17 Reporting

Under Article 11 of the Habitats Directive, each member state is obliged to undertake surveillance of the conservation status of the natural habitats and species in the Annexes and under Article 17, to report to the European Commission every six years on their status and on the implementation of the measures taken under the Directive. Raised bog habitats have been reported under three separate Article 17 reporting periods to date: 1994-2006 (NPWS, 2007), 2007-2012 (NPWS, 2013) and 2013-18 (NPWS, 2019). The survey and assessments carried out as part of this report will be used to inform Article 17 for the reporting period 2019-2024. The overall status for ARB and DRB for each of the reporting periods to date has been Unfavourable Bad – Declining. The rate of decline was estimated to be largest in the first reporting period and although the rate of decline slowed in subsequent reporting periods, a decline was still reported by NPWS in 2013 and again in 2019.

The National Conservation Status Assessment report requires information on four parameters: Range, Area, S&F, and Future Prospects, and also incorporates information relating to the pressures and threats and Conservation Measures operating on the habitats. Guidance on assessment is provided by the EU (DG Environment, 2023a). See section 2.5 for further detail.

The conservation status of DRB is very often related to the status of ARB. Site-specific conservation objectives developed by NPWS for all raised bog SACs recognised this interdependency between the three main raised bog habitats (7110, 7120 & 7150): “Based on the close ecological relationship between these three habitat types, it is not necessary to set conservation objectives for all three habitats individually. It is considered that should favourable conservation status for ARB be achieved, then Favourable conservation status for the other two habitats will also be

achieved (NPWS, 2017)". However, as outlined by Fernandez & Eakin, (in prep.), the methodology used to assess DRB status is not considered to cover all scenarios. For example, in the case of the Area status assessment, an overall increase in ARB after restoration works could occur (particularly at large sites) at the same time as actual DRB losses due to negatively impacting activities. Or, for example, regarding S&F, the ARB Area may not have increased as a result of recent restoration works, but DRB S&F may have improved within the same reporting period.

1.3 Strategic peatland management, conservation plans and policies

During the last Article 17 reporting period (2013-18) a substantial volume of conservation actions were initiated in relation to peatlands, including the development and implementation of actions relating to:

- The National Peatlands Strategy (NPWS, 2015), the purpose of which was to set down clear principles which will guide government policy in relation to all Irish peatlands. These principles were to be applied through their incorporation into the more detailed sectoral plans, policies and actions adopted and undertaken for each policy area. A total of 25 principles and 32 actions were set out in the Strategy. A mid-term review of the Strategy was published in 2021 (DHLGH, 2021).
- The NHA raised bog network review (NPWS, 2014). This review assessed over 200 raised bogs including the then existing network of NHAs (75 sites) as well as over 100 non-designated sites with the goal of improving the capacity of the network to meet nature conservation obligations while having regard to national and local economic, social and cultural needs. The review proposed a reconfigured NHA network involving the de-designation of a proportion of the existing NHA sites (46 sites to be de-designated, seven of which are to be partially retained), the full retention of 29 NHAs (plus partial retention of seven NHAs) and the designation of 25 new sites. Thus, the proposed new NHA network was to consist of 61 NHA sites, which once designated and restoration works are implemented, would provide a larger extent of both ARB and DRB than the previous network, as well as improving the geographical range of protected sites in Ireland. Following legislative changes this review will be updated and concluded, and the network reconfigured accordingly.
- The National Raised Bog SAC Management Plan (2017-2022) (NPWS, 2017).
    - This plan set out for the first time a roadmap for the long-term management, restoration and conservation of designated raised bogs. It set national conservation objectives and restoration targets for raised bog habitats within the national network of raised bog SACs and NHAs. Site-Specific Conservation Objetives (SSCOs) and restoration plans were developed for all SACs. This was then expanded to include the development of restoration plans for the 36 NHAs proposed for retention during the current reporting period. The plan identified the need to undertake the works outlined in each site's restoration plan as well as the need to designate two new SACs and implement the proposals in the NHA review to achieve the long-term national target of 3,600ha of ARB within the network of designated sites. In addition, the need for drainage management plans to be integrated into restoration plans was also identified. To this end Integrated Drainage Management Plans were developed for all 62 raised bog SACs and a selection of

NHAs. The purpose of the drainage management plans is to ensure that the main periphery drains surrounding a bog can be maintained in a way that will not impact on the integrity of the designated site, and that restoration works will not impact on adjacent lands.

- The plan also recognised the importance of community engagement, and the Peatlands Community Engagement Scheme (now Peatlands and Natura Community Engagement Scheme) was established by Department of Culture, Heritage and the Gaeltacht (DCHG) (now DHLGH) in 2017 as well as the Irish Community Wetlands Forum (CWF).
    - The Peatlands and Natura Community Engagement Scheme, encourages local initiatives for the conservation and revitalisation of Natura 2000 SACs and SPAs and all peatland areas, and promotes public engagement with and awareness of our natural heritage and environment. The focus of the scheme is on community-led projects and volunteer groups, who play a vital role in helping to promote and implement conservation and restoration in Ireland. A diverse range of projects/initiatives have been undertaken as part of the scheme since its inception including surveys to inform management plans for Natura 2000 and peatland sites, public outreach (such as the production of information booklets, brochures and training manuals), and invasive species training and management within raised bog SACs/NHAs or other peatland areas. The scheme aims to assist communities in the enhancement of their natural surrounding areas and to raise awareness of environmental issues and concerns.
    - The CWF aims to support the protection, management and wise use of Ireland's wetlands for sustainable communities, by providing a network for community wetland groups to share knowledge, ideas, research, and best practice.
- A further peatland scheme, the Protected Raised Bog Restoration Incentive Scheme, was also established as a result of the plan. This scheme, successfully piloted under EU LIFE *The Living Bog Project* which undertook restoration works on 12 SACs, is an area-based incentive and land purchase scheme, which accommodates restoration measures on raised bog SACs and NHAs as part of the national restoration programme. Results from *The Living Bog*, which ran from 2016-2022, indicate that 43 ha of ARB developed within just three years of restoration works on the five project sites where ecotope surveys were undertaken post-restoration. Eco-hydrological modelling indicates that 95% of the high bog ARB targets across all 12 project sites will be achieved over time (Crowley & Smith, 2022). Results on the cutover were also positive with a general trend of increases in High *Sphagnum* habitat and decreases in Low *Sphagnum* habitat. *The Living Bog* also described and defined ARB as occurring on cutover in the Irish context for the first time (Smith & Crowley, 2020) while acknowledging it will take longer to develop on the cutover than on the high bog. 4.6 ha of ARB was recorded and mapped on cutover across the eight sites surveyed post-restoration.

- Best practice restoration guidelines (Mackin *et al*., 2017a). This guidance document provides a detailed description of current best practice techniques for raised bog restoration and their scientific basis. The document highlights the importance of eco-hydrological modelling for quantifying raised bogs restoration potential by defining areas of DRB; the development of restoration plans for entire hydrological units (high bog and cutover) at each bog; monitoring of results and consultation with stakeholders. A review of these guidelines was produced by Cushnan *et al*. (2022) as part of *The Living Bog* deliverables.
- The Bord na Móna Biodiversity Action Plan (2016-2021) (BnM, 2017).

During the current Article 17 reporting period (2019-2024), further conservation actions and/or strategies/plans related to peatland (including raised bog) management in Ireland have been initiated, including:

- Ireland's Climate Action Plan (2024), which has a target to reduce the management intensity (which includes raising the water table to within 10 cm of ground level) of at least 80,000ha of drained, agriculturally managed, carbon-rich soils by 2030. If this target is realised, it is likely to have a positive impact on ARB.
- EU Nature Restoration Law (2024): Targets outlined in the Nature Restoration Law include EU member states needing to develop national restoration plans by 2026, resulting in the restoration of at least 30% of habitats in poor condition by 2030, 60% by 2040, and 90% by 2050. If these targets are realised, they will also likely have a positive impact on ARB.
- Ireland's 4th National Biodiversity Action Plan (2023-2030).
- The Enhanced Decommissioning, Rehabilitation and Restoration Scheme (EDRRS), a large-scale project, running from 2021 until 2026, aimed at rehabilitating and restoring previously harvested peatlands owned by BnM. This scheme is also referred to as the Peatland Climate Action Scheme (PCAS).
- Peatlands and People, a seven-year LIFE Integrated Project: This project runs from 2020 until 2027 and is targeting implementing restoration plans within designated raised bogs and improvements across over 10,000 ha (including 8,000 ha of deep peat) of peatlands with complementary actions over a larger area.
- Tóchar, three-year wetlands restoration project (2024-2026), based across eight midland counties, co-funded by the Government of Ireland and the European Union through the EU Just Transition Fund Programme. It is managed by the NPWS, (DHLGH), and a number of non-designated raised bog sites are included as part of the first year of the scheme in 2025.

1.4 Multi-Annual Raised Bog Monitoring Programme (MARBMP) 2021-24

This report is part of the deliverables under the *Multi-Annual Raised Bog Monitoring Programme (MARBMP) 2021-24*. The data generated from this project along with a similar but smaller project named the *Ecotope Mapping Project (EMP) within a sub-set of designated raised bogs 2024* contributed largely to the development of this report along with datasets and information provided by BnM and the NPWS. See Appendix 1 for a list of the deliverables under MARBMP.

2 Methods

2.1 Estimating the national ARB extent

Fernandez & Eakin (in prep.) estimated the extent of ARB present nationally in 2018 by producing the following spatial datasets:

- AR1719_RBs_Ecotopes_distribution: This dataset contained the most recent ecotope data for every raised bog on which an ecotope survey has been undertaken since the surveys began in 1994. This encompassed 155 bogs and included both designated and non-designated sites.
- AR1719_RBs_NoEcotopeAvailable_distribution. This dataset contained all remaining known areas of "intact" raised bog not included in the above dataset (AR1719_RBs_Ecotopes_distribution) for which detailed ecotope data is not available. The presence/absence and extent of ARB in these sites were evaluated either by non-comprehensive fieldwork surveys undertaken mainly by NPWS or BnM or by a comprehensive visual assessment of high-resolution aerial images from the period 2013-2016. Using these two methods, a total of 105 of these bogs were assessed as likely to be currently supporting ARB ranging from extents of 0.01 ha to 20.0 ha and totalling 168.5 ha. However, an arbitrary and conservative figure of 0.25 ha of ARB was given to most of the 74 bogs that were assessed as supporting ARB through the visual assessment of aerial photos. This, together with the fact that the presence of ARB on additional sites within this dataset was not ruled out, makes the 168.5 ha estimate of ARB likely to be an underestimate.
- AR1719_RBs_SecondaryDegraded_distribution. This dataset contains severely damaged high bog areas frequently devoid of vegetation (including the majority of BnM sites), cutaway bog (large areas commercially exploited), cutover and occasionally reclaimed agricultural land with peaty soils. These areas were assessed as currently supporting no ARB.

In the 2019-2024 reporting period, the first two of these datasets were updated, relabelled (AR1725_RBs_Ecotopes_distribution and AR1725_RBs_NoEcotopeAvailable_distribution) and changes in the extent of ARB assessed using the following methods:

- Ecotope Surveys and desktop analysis used to update AR1725_RBs_Ecotopes_distribution
- Walkover Surveys and desktop analysis used to update AR1725_RBs_NoEcotopeAvailable_distribution
- Cutover surveys used to create a new spatial dataset containing records of ARB on cutover labelled AR1725_ARB_onCutover_distribution. See Appendix 2 for description of this spatial dataset and all other spatial datasets updated or created during this assessment.

2.1.1 Habitat area

2.1.1.1 Ecotope surveys

During the 2019–2024 reporting period, NPWS commissioned two raised bog monitoring surveys. Together with BnM ecotope surveys and information on habitat management, including impacting activities, management plans and the

implementation of restoration plans, these surveys formed the main basis of the national assessment:

- Multi-Annual Raised Bog Monitoring Programme (MARBMP) 2021-24: This involved ecotope surveys of a total of 31 bogs across 22 designated sites (11 SACs and 11 NHAs) and one site proposed for designation (proposed NHA) as well as an appraisal of the Conservation Measures undertaken and the pressures and threats facing each site. Note that one of the NHAs surveyed (Lough Ree Bog East) and one of the sites proposed for designation surveyed (Cloniff Bog) are also part of SACs (Lough Corrib SAC and (River Shannon Callows SAC).
- Ecotope Mapping Project (EMP) within a sub-set of designated raised bogs 2024 (see Crushell *et al.,* 2024a): This involved ecotope surveys on a total of nine bogs. These included eight bogs within six designated sites (four SACs and two NHAs), and one site proposed for designation (proposed NHA). An appraisal of the Conservation Measures was undertaken, and the pressures and threats facing each site were recorded.

Both projects included a comprehensive survey of high bog vegetation (*i.e.*, community complexes and ecotopes), following the methods established by Fernandez *et al.* (2014) and updated by Crushell *et al.* (2024a), including revisions to the ecotope key and complex descriptions (see Appendices 3 and 4). MARBMP also produced conservation condition assessments for sites surveyed under both projects as well as for five bogs surveyed under *The Living Bog* (LB) LIFE restoration project (LIFE14 NAT/IE/000032).

In addition to the NPWS-commissioned monitoring projects, BnM undertook ecotope surveys of two SACs as well as 15 non-designated bogs across seven sites within their own network of bogs (including two proposed NHAs and one proposed SAC), mostly as part of the Peatlands Climate Action Scheme (PCAS). A conservation condition assessment was completed for one of these SACs. Local groups commissioned two further ecotope surveys: one by the Abbeyleix Bog Project (ABP) and one by the Friends of Kilconly Wetlands (FKW). A full list of the 64 bogs on which ecotope surveys were undertaken during the reporting period is given in Appendix 5, which also specifies the 46 bogs for which a conservation condition assessment was undertaken.

2.1.1.2 Walkover Surveys

A small number of site walkover surveys were undertaken during the reporting period (Crushell *et al*., 2021, 2022; 2023; 2024b, 2024c; Foss *et al*., 2020), during which the extent of ARB present on a site was estimated. See Appendix 6.

2.1.1.3 Desktop analysis of aerial imagery

A desktop analysis of aerial photos was undertaken to assess the current extent of ARB on bogs that are designated or proposed to be designated (as well as a small number of non-designated bogs). These were bogs where an ecotope survey had not been undertaken since before 2010 or where no ecotope survey had ever been carried out. Aerials used in the assessment were from Bluesky imagery and World imagery with dates ranging from 2019 to 2022. The bogs assessed in this way are given in Appendix 7a-d.

2.1.1.4 Cutover Surveys

Up until this reporting period, ARB was defined as occurring only on the high bog. However, a growing acknowledgement (*e.g*. Crowley *et al*., 2021) of the occurrence of peat-forming vegetation on cutover areas at some sites led to an appraisal of these habitats. A methodology was developed by Smith & Crowley (2020) for assessing whether an area of high *Sphagnum* on the cutover corresponds with ARB, based on numbers of positive indicator species, *Sphagnum* cover, and absence or low levels of negative indicator species. This is the first time that ARB has been recognised as occurring on cutover in the Irish context. In general, however, regenerating ombrotrophic vegetation on cutover characterised by a high *Sphagnum* cover (*i.e*. greater than 40-50% cover), lacks the diversity of *Sphagnum* species, micro-topographical features and good quality indicators associated with ARB. These cutover areas have the capacity to develop into embryonic ARB, although longer time periods (50-100 years) are likely to be required for high-quality ARB to develop.

The *Living Bog* LIFE project undertook cutover surveys on 12 project sites (with comprehensive surveys on eight of these) and mapped very small areas of ARB as occurring on six of the sites (Crowley & Smith, 2022). A small number of site-specific projects also undertook cutover surveys during the reporting period (Crushell *et al*., 2024b, 2024d; O'Loughlin, 2022) in which the extent of ARB present on a site was estimated. As these sites had not been surveyed previously, the extent of ARB was taken as having been the same in 2018. A number (*c.* 25 sites) of cutover surveys were also undertaken by BnM as part of baseline surveys, prior to restoration works in the NPWS National Raised Bog Restoration Programme. This data has not yet been compiled, but indications are that small areas of ARB were recorded on at least five of these sites. See Appendix 8 for a list of sites on which ARB has been recorded on the cutover.

2.1.1.5 Other data

Sites that were surveyed by Fernandez *et al*. (2014), Crushell *et al*. (2019) or *The Living Bog* and have not been re-surveyed were not re-assessed as part of this project. While the extent of ARB on each of these individual bogs is likely to have changed, the overall extent of ARB across these sites is expected to have remained broadly stable. Sites that were surveyed by NPWS in the period 2015-18 and BnM in 2010-2018 were treated in a similar manner. During this project, 11 of the 74 sites where the extent of ARB present was previously estimated by analysis of aerial imagery (Fernandez & Eakin, in prep.) were re-assessed. This was either through analysis of aerial photos (five sites listed at the end of Appendix 7d) or ground surveys (six sites listed in Appendix 6). The remaining 63 sites were confirmed through analysis of aerial photos to still be present but were not assessed in any detailed way. The extent of ARB present on these sites was taken to have remained stable.

2.1.2 National ARB habitat distribution and range maps

A review of two (of the three) national raised bog distribution spatial datasets (described above) compiled in 2019 by Fernandez & Eakin (in prep.) has been undertaken as part of this new assessment, as well as the generation of a fourth dataset of ARB on cutover.

The 10 km grid cells ITM shapefile created by Fernandez & Eakin (in prep.) and named AR1719_7110_7120_10kmDistrGrid_Comprehensive was also updated during the mapping process and relabelled

AR1725_7110_7120_10kmDistrGrid_Comprehensive. The layer indicates all 10 km x 10 km cells (hereafter referred to as 10 km grid cells) in which ARB and/or DRB are present and thus are part of their current distribution, as well as those cells which are part of the habitats current Range and FRR. This layer's attribute table provides information on the sources of each individual ARB and DRB record (see Appendix 2), as well as the list of cells included in these two habitats' 2013 and 2019 distribution, Range and FRR maps, for comparison purposes.

The above spatial datasets were produced in polygon shapefile format in ArcGIS Pro using the Irish Transverse Mercator (ITM) as the co-ordinate reference system.

No one single map showing all ARB national records can be generated with the data currently available, due to the different levels of resolution of habitat records. As a result, all known ARB records are provided in three separate datasets, with different levels of mapping accuracy, as follows:

- AR1725_RBs_Ecotopes_distribution: this dataset provides detail (*i.e.* ecotope level) raised bog vegetation data. ARB within it is made of active flushes/soaks, central and sub-central ecotopes and Bog woodland (91D0).
- AR1725_RBs_NoEcotopeAvailable_distribution: there are two components within this dataset, which catalogue records of ARB and DRB separately:
    - ARB: where 'present' has been entered under the field ARB25_1, then ARB is believed to be present within the polygon. This dataset contains ARB records for which ecotope data is not available. The extent of ARB within each record (bog) is generally much smaller than within records in the ecotopes distribution dataset, and the accuracy of the location and extent of ARB is lower. Note that the extent of ARB within each record (bog) is an estimate and is usually estimated to be a small percentage of the overall polygon.
    - DRB: where 'present' has been entered under the field DRB25_1, then DRB is believed to be present within the polygon. This dataset contains DRB records for which ecotope data (and sometimes eco-hydrological modelling data) is not available. Most of the records have not been confirmed through eco-hydrological modelling. The extent of DRB within each record (bog) is an estimate and is usually estimated to be a small percentage of the overall polygon.
- AR1725_ARB_onCutover_distribution: this dataset contains ARB records for which ARB on cutover has been confirmed.

ARB records from the three above datasets have been used to generate the 10 km grid cells habitat distribution map (AR1725_7110_CD.shp). There are four 10 km cells (G91, M13, R06 and R57) that intersect AR1725_RBs_NoEcotopeAvailable_distribution.shp polygons where the ARB within the polygons lies outside these cells. Thus, these cells are not considered to be part of AR1725_7110_CD.shp map.

But the ARB within those polygons lies outside these cells

The 2019 ARB 10 km distribution, Range and FRR maps have been revised as part of this assessment and compared against new maps.

2.2 National DRB habitat distribution and Range maps

DRB is defined and mapped based on an eco-hydrological model (NPWS, 2014; NPWS, 2017).

Fernandez & Eakin (in prep.) noted that a DRB habitat distribution map named RBSB13_Restoration_Potential_DRB was generated as part of the NHA review project, which looked at all known raised bog sites of national conservation value (over 270 sites). It was also acknowledged that DRB is present in many other raised bogs corresponding with "intact" high bog reported in the AR1719_RBs_NoEcotopeAvailable_distribution map. However, as the DRB predictive model has not been run for all bogs within that dataset, its occurrence within many of them is unknown.

The 2019 national DRB 10 km grid cells distribution map (NPWS, 2019) was thus consisted of all cells intersecting DRB records as determined by the predictive model, plus any other cell not intersected by this dataset containing at least one bog within AR1719_RBs_NoEcotopeAvailable_distribution map with suitable conditions to support the habitat. These conditions were reported as follows:

a) sites with over 30 ha of high bog, with typical bog vegetation, which were part of a larger bog, and contain drains which could be blocked and

b) smaller sites (<30 ha) within a small basin with drains present, which could be blocked. These are more frequently found in the NE of the national raised bog distribution (*e.g*. county Cavan).

The occurrence of DRB was ruled out from sites where the high bog area was below 30 ha, which were once part of much larger site, was surrounded by facebanks and/or did not feature drains which could be blocked. A precautionary approach was taken during the mapping process to avoid ruling out DRB from sites for which there was a reasonable level of uncertainty.

2.3 Pressures and Threats

Pressures have acted within the current reporting period and they have an impact on the long-term viability of the habitat and its typical species. Threats are future/foreseeable impacts within the next two reporting periods (*i.e*. within 12 years following the end of the current reporting period) that are likely to affect the long-term viability of the habitat.

Pressures and threats to the conservation status of ARB were assessed during ecotope surveys, via consultations with NPWS staff and through analysis of aerial imagery. Each pressure/threat identified was assigned to a category detailed by the EU Article 17 guidance documents for the 2019-24 reporting period (DG Environment, 2023b). A total of thirteen categories were used including PC05 Peat extraction and associated drainage, PL02 Drainage (general), PK04 Atmospheric N-deposition, PB24 Drainage for forestry and PA22 Drainage for use as agricultural land. The full list of categories used are listed and described in detail in Appendix 9. This also includes a description of how each pressure and threat was ranked per site.

2.4 Conservation Measures

Conservation Measures undertaken with the aim of improving the conservation status of ARB were assessed during ecotope surveys, via consultations with NPWS staff and through analysis of aerial imagery. Each conservation measure identified was assigned to a category detailed by the EU Article 17 guidance documents for the 2019-24 reporting period (DG Environment, 2023c). The categories used include MC02 Adapt/manage exploitation of energy resources, MC07 Habitat restoration/creation from resources, exploitation areas, MK03 Restoration of habitats impacted by multi-purpose hydrological changes, MA13 Manage agricultural

drainage and water abstraction and MI03 Management, control or eradication of other invasive alien species. The full list of categories used are listed and described in detail in Appendix 10. This also includes a description of how each Conservation Measure was ranked per site. Note that any one Conservation Measure can address more than one pressure and threat.

2.5 Conservation status assessment

Habitat assessments provided within this report are based mainly on 46 site-specific habitat Conservation Condition Assessments (CCAs), as well as additional information related to activities impacting either negatively or positively on the habitats within the reporting period (2019-2024) and/or expected to do so in the future (next two reporting periods).

2.5.1 Conservation status assessment general methods

The conservation status of a habitat is defined as the sum of the influences acting on the habitat that may affect its long-term viability. The EU Habitats Directive (92/43/EEC) requires that habitats listed under Annex I are maintained in 'Favourable Conservation Status' throughout member states. Maintaining or restoring Favourable Conservation Status for Annex I habitats is an objective under Article 2 of the Habitats Directive. Conservation Status of a habitat is favourable when:

a) its natural Range and the Area it covers within that Range are Stable or Increasing,

b) the specific Structure and Functions (S&F) which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future and

c) the conservation status of its typical species is favourable.

To assess the conservation status of an Annex I habitat at a national level, four parameters are scored objectively: a) Range, b) Area, c) S&F, and d) Future Prospects (FPs). Elements of the guidelines for assessing conservation status at national assessment can be scaled down to derive a site-based assessment (conservation condition assessment). Range is not considered at site level.

The method for the assessment of conservation status of an Annex I habitat involves the application of a "traffic-light" system and brings together information on the four parameters for each habitat (three at site level). Each parameter is assessed as having a "Favourable (FV)" or good/green, "Unfavourable-Inadequate (U1)" or poor/amber, "Unfavourable-Bad (U2)" or bad/red and "Unknown" or grey conservation status based on DG Environment (2022) (see Table 1).

Table 1 provides percentage comparative values (current versus Favourable Reference Values) for each individual parameter, below which the parameter is assessed either as FV, U1 or U2, as given by DG Environment (2022). These percentage values have been amended and made slightly higher at site level, to take into account an estimated potential 5% discrepancy, due to differences in assessment methods (*i.e*. mapping, habitat interpretation), as described under each specific habitat assessment method below.

A current trend attribute is also given to each parameter (*i.e.* Range, Area, S&F and FPs) conservation status assessment. Long-term (2001-2024) and Short-term (2013-2024) trends are given to Range, Area and S&F. Trend values indicates whether the status is Increasing/Improving, Stable or Decreasing/Declining. A short trend value is also given at overall habitat assessment level. The overall trend value is based on

the idea that the most negative trend determines the overall trend. A Stable trend has a nil value, which means the trend for the specific parameter has not changed in the reporting period or is not going to change in the future as regards FPs. Once one of the three parameters is given a Declining/Decreasing trend, the overall trend for the habitat is negative. On the other hand, a combination of neutral and positive (Increasing/Improving) trends results on an overall positive trend for the habitat.

The impact of current Pressures, future Threats and Conservation Measures are used to determine the FPs of the Range, Area and S&F. FPs indicate the direction of expected change in conservation status in the near future.

If any one of the parameters a) Range, b) Area, c) S&F, and d) FPs are assessed as "red", the overall assessment is also "red" (*i.e.* Unfavourable Bad). All parameters must be green to achieve an overall Favourable assessment. Any other combination results in an Unfavourable Inadequate overall assessment.

Favourable Reference Values (FRVs) are values that should be achieved (targets) in order for a habitat to reach a Favourable Conservation Status. These reference values have to be at least equal to the value when the Directive came into force (*i.e.* 1994) or greater than this value if the long-term viability of the habitat is not assured. The exception to this rule is DRB as this habitat should reduce if it is successfully restored to ARB.

Table 1 Summary matrix of the parameters and conditions required to assess the conservation status of habitats (DG Environment, 2022).

Parameter	Conservation status			
	Favourable ('green')	**Unfavourable – Inadequate ('amber')**	**Unfavourable – Bad ('red')**	**Unknown (insufficient information to make an assessment)**
Range	Stable (loss and expansion in balance) or increasing AND not smaller than the 'favourable reference range'	Any other combination	Large decrease: Equivalent to a loss > 1% per year OR More than 10% below 'favourable reference range'	No or insufficient reliable information available
Area covered by habitat type within Range [1]	Stable (loss and expansion in balance) or increasing AND not smaller than the 'favourable reference area' AND without significant changes in distribution pattern within range	Any other combination	Large decrease in surface area: Equivalent to a loss of > 1% per year OR With major losses in distribution pattern within range OR More than 10% below 'favourable reference area'	No or insufficient reliable information available
Specific structures and functions (including typical species)	Structures and functions (including typical species) in good condition and no significant deteriorations / pressures	Any other combination	More than 25% of the area is unfavourable as regards its specific structures and functions	No or insufficient reliable information available

Parameter	Conservation status			
			(including typical species)[1]	
Future prospects (as regards Range, Area covered and specific Structures and Functions)	The habitats prospects for its future are excellent / good, no significant impact from threats expected; long-term viability assured	Any other combination	The habitats 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'

2.5.1.1 Range

Current Range is defined as the area over which a species or habitat is usually found. For the purposes of this exercise, and as reported in 2019, the current Range is taken to be the outer limits of the overall area in which a habitat is found at present. It can be considered as an envelope within which areas actually occupied occur (DG Environment, 2017).

The calculation of the current Range is based on the current national habitat distribution map. Range is then depicted as those 10 km grid (ITM) cells intersecting the national habitat distribution map. For Article 17 reporting the European Environment Information and Observation Network (EIONET) commissioned a Range Tool, an ArcGIS extension to generate a standardised grid-based range in accordance with Article 17 guidance. The tool "is based on calculating the distances between the centroids of grid cells and then constructing a series of poly lines and polygons to connect other centroids of grid cells based on the 'gap distance' specified. All cells that intersect these polylines and polygons, as well as distribution cells are used to create the range" (Evans & Arvela, 2011). The Range is then mapped based on the Range mapping rules set by the EU (DG Environment, 2017): Horizontal or vertical gaps in the habitat distribution of three or more grid squares or oblique gaps of two or more squares are deemed enough to justify a break in the Range. Where ecological conditions for the development of the habitat are deemed unsuitable, gaps of just one grid square may also be permitted. Current Range value should be compared against the Favourable Reference Range value.

Favourable Reference Range (FRR) is the range within which all significant ecological variations of the habitat are included for a given biogeographical region and which is sufficiently large to allow the long-term viability of the habitat. FRR must be at least the value given when the Directive came into force. In the particular case of ARB, the FRR is currently considered to be the current Range of ARB plus the current range of DRB, according to the definition of DRB in the Habitats Directive Interpretation Manual (CEC, 2013). DRB should be capable of regeneration to ARB in 30 years if appropriate measures are put in place (*i.e*. no major impacting activities are present and any necessary restoration works are implemented). On the other

[1] There may be situations where the habitat area has decreased as a result of management measures to restore another Annex I habitat (*e.g*. DRB being restored to ARB). The habitat could still be considered to be at 'Favourable Conservation Status' but in such cases details in the Complementary Information section must be given.

hand, as the national objective for DRB is to restore the entire national resource to ARB, the FRR for DRB is now considered to be 0 ha and thus a FRR smaller than the current Range is established. A current Range which is more than 10% below the FRV is considered Unfavourable-Bad (see Table 1).

An assessment of this parameter's trends for all habitats must be provided, by comparing Current Range values against values given in 2000 and 2013 to generate Long-term (2001-2024) and Short-term (2013-2024) trends. In addition, an assessment of the 2019-2024 period term should be also generated. Trend values can be Stable / Increasing / Decreasing / Uncertain / Unknown.

2.5.1.2 Area

Area is defined as the area currently (2024) occupied by the habitat within the range in the biogeographical region (DG Environment, 2017).

The current Area value should be compared to the Favourable Reference Area (FRA), which is defined as the minimum value required for the long-term viability of the habitat and must be at least the value given when the Directive came into force. The assessment of the conservation status of Area should be also based on any change in Area in the reporting period. An assessment of this parameter's trends for all habitats must be provided, by comparing Current Area values against values given in 2000 and 2013 to generate Long-term (2001-2024) and Short-term (2013-2024) trends. In addition, an assessment of the 2019-2024 period term should be also generated. Trend values can be Stable / Increasing / Decreasing / Uncertain / Unknown.

2.5.1.3 Structure and Functions

Habitat Structure is defined by the physical components of a habitat type (*e.g*. assemblages of species or abiotic features) whereas Functions are the ecological processes occurring at a number of temporal and spatial scales (*e.g*. regeneration, nutrient cycling).

The S&F assessment is based on the assessment of the condition (Quality) of the habitat. In the particular case of ARB, the status assessment is based on the percentage value of the best quality ecotope types (central, active flush/soaks and bog woodland) within ARB. The target is that a minimum of 50% of the ARB Area should consist of the best quality ecotope types.

The Area of each habitat in good and not-good condition must be provided. A 90% threshold for Habitat in good condition for Favourable status is recommended (but only if there is a Stable or Increasing trend).

An assessment of this parameter's trends should be provided, by comparing current values against values given in 2000 and 2013 to generate Long-term (2001-2024) and Short-term (2013-2024) trends. In addition, an assessment of the 2019-2024 period term should be also generated. Trend values can be Stable / Improving / Declining / Uncertain / Unknown.

The assessment of typical species condition is indirectly based on the assessment given to S&F. Thus, in the case of ARB, a positive assessment for S&F implies an increase in the extent of the best quality ecotope types and thus a positive assessment for typical species. On the other hand, an increase in the most degraded ecotopes and thus a negative assessment for S&F implies a negative assessment for the typical species.

2.5.1.4 Future Prospects

The assessment of the habitat's overalls FPs should take into consideration the expected Future Prospects of all three Range, Area and S&F. FPs are determined by assessing the balance between the Pressures and Threats negatively impacting the conservation status of habitat and positively impacting activities (*i.e.* Conservation Measures). The latter include management or restoration actions plans developed to maintain or to restore habitats to Favourable Conservation Status.

Pressures have acted within the current reporting period, and they have an impact on the long-term viability of the habitat and its typical species. Threats are future/foreseeable impacts (within the next two reporting periods (*i.e*. within 12 years following the end of the current reporting period)) that are likely to affect the long-term viability of the habitat.

Pressures and Threats are then ranked as (see Appendix 9 for more detail):

- High importance/impact: Important direct or immediate influence and/or acting over large areas. A pressure is the major cause or one of the major causes, if acting in combination with other Pressures, of significant decrease in habitat Range or Area, range or area of habitat with good conditions; or pressure acting over large areas preventing the habitat from being restored to Favourable Conservation Status.
- Medium importance/impact: Medium direct or immediate influence, mainly indirect influence and/or acting over moderate part of the area/acting only regionally (other pressure not directly or immediately causing significant declines).
- Low impacting Pressures/Threats are Pressures/Threats that do not fit into the above category but are included in the assessment as they are currently having a minor influence but may need to be monitored.

For each parameter (Range, Area, and S&F), prospects are given a 'good', 'poor', 'bad' or 'unknown' value. FPs of each of the three parameters reflect their future trends, which are the result of the balance between Threats and Conservation Measures and how this will impact on the parameter's prospects in the next two reporting periods. Each attribute FPs is compared against their current conservation status.

The 2024 national assessment of habitats FPs is based on data gathered at a national level, the FPs assessment results at site level and additional information related to Pressures, Threats and conservation management actions provided in site-specific conservation condition assessments. The assessment of expected influence of both negative (*e.g.* turf cutting, drainage maintenance) and positive activities (*e.g*. restoration actions) is based on trends recorded in the current reporting period and how these are likely to vary in the following two reporting periods. The assessment also takes into account the level of implementation of Conservation Measures in the current reporting period and how these are expected to positively affect the habitats in the next 12 years.

Future Prospects indicate the direction of expected change in conservation status in the near future (two reporting periods/12 years) based on a consideration of the current status, reported pressures and threats, and measures being taken for each of the three parameters (Range, Area, and S&F). DG Environment (2023a) state that Future Prospects should be evaluated by individually assessing the expected future trends and subsequently Future Prospects of each of the other three parameters (Range, Area of the habitat, S&F), 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.

To differentiate between a future trend of negative and very negative (and positive or very positive) trends the threshold of 1% per year, meaning approximately 12% in 12 years, is recommended (DG Environment, 2023a).

2.5.1.5 Overall assessment of conservation status

The overall habitat conservation status is based on the assessment for each parameter of conservation status using the four categories available: 'Favourable' (FV), 'Unfavourable-inadequate' (U1), 'Unfavourable-bad' (U2) and 'Unknown' as per the criteria given in the evaluation matrix (Table 1).

2.5.1.6 NATURA 2000 coverage for Annex I habitat types

An assessment of how the Natura 2000 contributes to the conservation of the habitat is also provided. This consists of surface area of habitat and short-term trend of surface area in good condition within the Natura 2000. Trend values are as follows Stable / Increasing / Decreasing / Uncertain / Unknown.

2.5.2 Active Raised Bog conservation status assessment

The assessment for ARB follows the same methods as Fernandez and Eakin (in prep.) for the 2019 Article 17 report (NPWS 2019).

Range - this parameter can only be assessed at national level (not site level) and the assessment is based on the comparison of current Range value against the FRV, as well as on the comparison of current Range against the Range reported in 1994, 2007, 2013 and 2019 in order to assess this parameter's trends (see section 2.5.1.1 for further detail on how the Range is calculated).

Area - this parameter is assessed at national and site level. In the current reporting period (2019-2024), 46 site-specific conservation condition assessments were completed. ARB Area assessment is based on the comparison of current habitat Area against its FRV.

The National Raised Bog SAC Management Plan (NPWS, 2017) assessed the national ARB Area FRV as being 3,600 ha, corresponding with the extent of ARB and DRB within the current SAC and NHA network when the Habitats Directive came into force in 1994. The national ARB Area FRV was reviewed by Fernandez & Eakin (in prep.) and estimated to be 4,159 ha when the area within non-designated sites was included. The FRV for ARB area of 3,600 ha within the network of designated sites as well as the national FRV of 4,159 ha (including non-designated sites) given by Fernandez & Eakin (in prep.) remains unchanged in this 2024 assessment.

ARB Area at both national and site level is given a status assessment based on the following thresholds, following the procedure of Fernandez & Eakin (in prep.) (see Table 2):

- A current Area greater, equal or 0-5% below FRV falls into the Favourable assessment category.
- A current Area value 5%-15% below FRV falls into the Unfavourable Inadequate assessment category.

- A current Area value more than 15% below FRV falls into the Unfavourable Bad assessment category.

Area is also given a trend assessment based on the change on its value in the reporting period and also in the Long-term (2001-2024) and Short-term (2013-2024) periods. Trend is then assessed as Stable, Increasing or Decreasing.

Structure and Functions - this attributes' assessment is based on the objective that at least half of the current area of ARB is made up of active flush/soaks, Annex Bog woodland and central ecotopes (*i.e*. the most pristine examples of ARB vegetation), both at national and site level. This value is considered to be the S&F FRV.

S&F at both national and site level is given a status assessment based on the following thresholds (see Table 2):

- A current central ecotope and active flush/soaks/bog woodland area value greater, equal or 0-5% below FRV falls into the Favourable assessment category.
- A current central ecotope and active flush/soaks/bog woodland area value 5%-25% below FRV falls into the Unfavourable Inadequate assessment category.
- A current central ecotope and active flush/soaks/bog woodland area value more than 25% below FRV falls into the Unfavourable Bad assessment category.

S&F are also given a trend assessment based on changes in extent of both active flush/soaks and central ecotopes in the reporting period. Long-term (2001-2024) and Short-term (2013-2024) trends are also provided. Trend is given a Stable, Improving or Declining value.

For those sites where active flush/soaks and central ecotopes are absent or their area is small (<1ha), changes in sub-central ecotope extent and quality characteristics is examined to assess ARB S&F status and trend.

An assessment of the condition of typical species (*e.g.* distribution and abundance) is provided within each conservation condition assessment. This is based on the assessment of S&F (*i.e*. changes in best quality vegetation), as well as on analysing quadrat data and community complex descriptions.

Table 2 ARB assessment method.

Area		Structure and Functions	
Current value > = or 0-5% < FRV	F	Current value > = or 0-5% < FRV	F
Current value 5%-15% < FRV	UI	Current value 5%-25% < FRV	UI
Current value 15%-100% < FRV	UB	Current value 25%-100% < FRV	UB

F: Favourable; UI: Unfavourable-Inadequate; UB: Unfavourable-Bad

Future Prospects - the FPs assessment is based on the expected influence of Pressures, Threats and Conservation Measures on each of the three main parameters: Range, Area and S&F within the next two reporting periods (12 years). FPs are given a 'good', 'poor', 'bad' or 'unknown' value.

The overall habitat conservation status assessment is then based on the "traffic-light" system (see Table 1). If any one of the four parameters a) Range, b) Area c) S&F d) FPs are assessed as "red", the overall assessment is also "red" (*i.e*. Unfavourable Bad). All parameters must be green to achieve an overall Favourable assessment. Any other combination result in an Unfavourable Inadequate assessment.

2.5.3 Degraded Raised Bog conservation status assessment

The assessment for DRB follows the same methods as Fernandez & Eakin (in prep.) for the 2019 Article 17 report (NPWS, 2019).

Range - this parameter can only be assessed at national level (not site level) and the assessment is based on the comparison of current Range value against the FRV, as well as on the comparison of current Range against the Range reported in 1994; 2007, 2013 and 2019 in order to assess this parameter's trends (see section 2.5.1.1 for further detail on how the Range is calculated).

Area - this parameter is assessed at national and site level. The assessment should be based on the comparison of current habitat Area against its FRV. The definition of DRB implies it is capable of being restored to ARB. Therefore, the FRV at national and site level is 0ha as all DRB should be converted to ARB. An increase in DRB is not seen as a positive development.

NPWS (2017) established the objective of restoring all DRB within the new network of designated sites (1,765 ha) into ARB.

DRB Area at both national and site level is given a status assessment based on the following thresholds:

- A current Area value smaller or 0-5% greater than FRV falls into the Favourable assessment category.
- A current Area value 5%-15% above FRV falls into the Unfavourable Inadequate assessment category.
- A current Area value more than 15% above FRV falls into the Unfavourable Bad assessment category.

The assessment of changes in habitat Area should be based on changes in the extent of the habitat as depicted by the model. The absence of topographical datasets (LiDAR) within two separate dates in the reporting period (2019-2024) for those sites recently assessed, has not enabled assessments of changes in DRB. As a result, DRB Area assessment for those sites assessed in the reporting period is based on the results of ARB Area conservation condition assessments. This methodology is not considered to cover all different scenarios (*e.g.* an overall increase in ARB after restoration works could occur at the same time as actual DRB losses due to negatively impacting activities (particularly at large sites)). Further refinement of DRB assessment methodologies is recommended, as discussed by Fernandez and Eakin (in prep.).

An Area trend assessment based on the change on Area value in the reporting period (2019-2024) is also generated. Trend is assessed as Stable, Increasing or Decreasing. Any decrease in the habitat Area as a result of an increase in ARB is taken as positive as regards an overall raised bog assessment.

Structure and Functions - The previous two assessments by Fernandez *et al*. (2005, 2014), assessed the condition of this attribute based on changes in the extent of marginal and facebank (*i.e.* drier and lowest quality vegetation communities). The main objective was that a maximum of 25% of DRB Area should be made up of these two ecotopes. This value was set as the S&F FRV. DRB is an atypical habitat type as a FRV smaller than current value is desirable due to its current degraded condition. Current values are then compared against FRV to determine whether S&F are Favourable, Unfavourable Inadequate or Unfavourable Bad.

The new interpretation of the habitat based on the eco-hydrological model has shown that there is no consistent, direct relationship between non-active ecotopes and the

areas identified as DRB by the model. This means that, for instance, sub-marginal ecotope (wetter and highest quality non-active areas) may or may not correspond with DRB. Nevertheless, an increase or decrease in marginal and facebank ecotopes within the modelled area would generally indicate a decline or an improvement in habitat Quality (S&F) in the reporting period.

An assessment of the condition of typical species (*e.g*. distribution and abundance) is generally provided within each site report. This is based on the assessment of S&F (*i.e*. changes in best quality vegetation), as well as by analysing quadrat data and community complex descriptions.

A S&F trend assessment is also generated. A decrease due to rewetting processes is taken as positive, whereas an increase as a result of further drying out is taken as negative. Trend is given a Stable, Improving or Declining value.

As with habitat Area, the absence of LiDAR-based topographical datasets within two separate dates in the reporting period for those sites recently assessed, has not enabled the assessment of DRB S&F changes. Therefore, further refinement of DRB assessment methodologies is recommended. As a result, DRB S&F assessment for those sites assessed in the reporting period is based on the results of ARB conservation condition assessments. This methodology is not considered to cover all different scenarios (*e.g*. ARB Area may not have increased as a result of recent restoration works but DRB S&F may have improved in the same reporting period (*i.e.* sub-marginal ecotope increase at the expense of marginal ecotope).

Future Prospects (FPs) - the FPs assessment is based on the expected influence of Pressures, Threats and Conservation Measures on each of the three main parameters: Range, Area and S&F within the next two reporting periods (12 years). FPs are given a ‘good’, ‘poor’, ‘bad’ or ‘unknown’ value.

The overall habitat conservation status assessment is then based on the “traffic-light” system (see Table 1). If any one of the four parameters a) Range, b) Area c) S&F d) FPs are assessed as “red”, the overall assessment is also “red” (i.e. Unfavourable Bad). All parameters must be green to achieve an overall Favourable assessment. Any other combination result in an Unfavourable Inadequate assessment. The only exception for DRB is when the Area has decreased as a result of the development of ARB. In such a scenario, the Area is given an Increasing trend, and the overall habitat conservation condition assessment trend is Improving. This is generally coupled by an improving trend in S&F.

3 Results

3.1 ARB habitat mapping

3.1.1 Habitat area

The overall estimate of the extent of ARB in Ireland in 2024 was 1,843 ha and a breakdown of how this was estimated is shown in Table 3. Surveys during the reporting period confirmed the presence of ARB in 937 ha (51%) of this total, with detailed ecotope surveys mapping 925 ha or 50% of the total ARB, during the reporting period (see section 3.1.1.1). A desktop update of old data, most of which was derived from ecotope surveys pre-2010, accounted for 327 ha (18%) of the total estimated ARB (see section 3.1.1.4) and unaltered data from a variety of sources used by Fernandez and Eakin (in prep.) accounted for 579 ha (31%) of the total estimated ARB. Ecotope surveys from 2010-18 accounted for 541 ha of this 579 ha.

3.1.1.1 Ecotope surveys during the reporting period

Ecotope surveys were undertaken on 64 bogs during the reporting period (see Appendix 5 for further detail). Thirty of the bogs are within 22 different SACs, 13 bogs are in 13 separate NHAs, three bogs are in one proposed SAC, nine bogs are in five separate proposed NHAs and nine bogs are in six separate non-designated sites. The extent of ARB mapped on these 64 bogs during the reporting period amounted to 925 ha as follows:

- 468.3 ha of ARB mapped on 31 bogs across 22 designated sites and one site proposed for designation from 2021 to 2024 by the Multi-Annual Raised Bog Monitoring Programme. Seventeen of these bogs, comprising 385.1 ha of ARB, occur across 11 SACs, while a further 11, comprising 74.1 ha of ARB, occur in separate NHAs. Lough Tee Bog NHA partly overlaps an SAC, and three other NHAs (Scohaboy, Girley and Aughrim) each encompass an entire SAC where DRB, but not ARB, is a Qualifying Interest (QI). A further three bogs occur within one proposed NHA.
- 71.2 ha of ARB mapped on nine bogs across six designated sites and one site proposed for designation in 2024 by the Ecotope Mapping Project. Six of these bogs (amounting to 67.1 ha of ARB) are in four separate SACs, two (3.3 ha of ARB) are in separate NHAs and one (0.8 ha of ARB) is a proposed NHA.
- 183.5 ha of ARB mapped on five bogs across five SACs in 2020-21 by The Living Bog.
- 29.9 ha across two SACs by BnM; 9.5 ha of ARB mapped on Mount Hevey SAC (002342) in 2020 by BnM and 20.4 ha of ARB mapped by BnM on Ardgraigue Bog SAC (002356) in 2024.
- 152.3 ha of ARB mapped on 15 bogs across seven sites within the BnM network of bogs, mostly as part of the Peatlands Climate Action Scheme. Three of these bogs are in one proposed SAC, four are in two separate proposed NHAs and eight are in five separate non-designated sites.
- 13.8 ha of ARB mapped on a proposed NHA (000736) by the Abbeyleix Bog Project (ABP) in 2020 and 5.8 ha mapped on Cloonbar Bog by the Friends of Kilconly Wetlands in 2024.

3.1.1.2 Walkover surveys during the reporting period

Walkover surveys were undertaken of the high bog on six sites during the reporting period (see Appendix 6) with an estimated 5.8 ha of ARB recorded across four of these sites.

3.1.1.3 Cutover surveys during the reporting period

Cutover surveys across nine sites during the reporting period identified approximately 6.3 ha of ARB (see Appendix 8) as occurring on cutover using the Smith & Crowley (2020) definition of ARB. Additional cutover surveys of several designated sites were undertaken by BnM during the reporting period, with small amounts of ARB identified on some of these. The data from these surveys was not finalised by the time of this report, therefore, 6.3 ha can be taken to be the minimum of ARB on cutover. However, using the Living Bog cutover surveys as a guideline, it can be estimated that the extent of ARB on cutover is generally low. Across the eight Living Bog cutover sites that were comprehensively surveyed, two supported no ARB on cutover and the remaining six supported a total of 4.6 ha of ARB on cutover (Crowley & Smith, 2022). This 4.6 ha was part of 13.0 ha of ombrotrophic areas of high *Sphagnum* cover identified on these eight sites.

3.1.1.4 Desktop analysis of old data during the reporting period

Analysis of aerial imagery (Bluesky and World imagery, which ranged in years from 2019 to 2022) was used to update old (mainly pre-2010) data. This included data on all designated sites that were not surveyed since before 2010, as well as all proposed NHAs, all NHAs proposed to be de-designated and 12 non-designated sites (See Appendix 7). This resulted in an estimate of 327.3 ha of ARB across 95 bogs as follows:

- 147.6 ha of ARB across 10 SACs and one NHA, plus an additional 2.1 ha in an SAC where ARB is not a QI
- 69.5 ha of ARB across 20 proposed NHAs
- 74.5 ha of ARB across 51 bogs in 50 NHAs that are proposed to be de-designated
- 33.7 ha ARB across 12 non-designated sites

3.1.1.5 Other data

Data from ecotope surveys of SACs or NHAs proposed for retention, undertaken from 2010-2018 was used without further analysis to help estimate the current national extent of ARB (See Appendix 11). Other data collected in the 2010-18 period was also used, unaltered. This included the following sources:

- Twenty bogs across 19 SACs were surveyed by Fernandez *et al*. (2014) and have not been re-surveyed. Ecotope surveys in the 2011-13 period estimated that these bogs support 291.2 ha of ARB. ARB is likely to have decreased on some of these sites such as Monivea Bog SAC (002352) and Bellanagare Bog SAC (000592), where impacting activities such as drainage and turf cutting were ongoing during the reporting period. On the other hand, ARB is likely to have increased on other sites such as Knockacoller Bog SAC (002333) and Kilsallagh Bog SAC (000285) due to the impacts of restoration works. While the amount of ARB on each individual bog is likely to have changed, the overall figure of 291.2 ha of ARB across these 20 bogs is assessed as having remained broadly stable.

- Ecotope surveys in 2018 of 17 bogs across 17 NHAs undertaken by Crushell *et al*. (2019) estimated that these bogs support 155.0 ha of ARB.
- One bog in a single SAC (Carrowbehy Bog SAC 000597) was estimated to support 72.8 ha of ARB by The Living Bog surveys in 2017.
- Seven bogs (four across three SACs and three non-designated) were surveyed by the NPWS in the period 2015-18 and have not been re-surveyed. A total of 23.3 ha of ARB was estimated to have occurred on these sites during those surveys. Three of these amounting to 7.5 ha were detailed ecotope surveys undertaken as part of Article 6.3 investigations and the other four amounting to 15.8 ha were walkover surveys.
- Five bogs in one proposed SAC (pSAC 002192) and one bog in another pSAC (pSAC 002191) were surveyed partially in the early 2010s and partially in 2017 by BnM. The extent of ARB recorded was 4.4 ha and 3.8 ha respectively. The three other bogs within pSAC 002191 were re-surveyed in 2024 and the extent of ARB within these three bogs was estimated to have increased significantly due to restoration works. Increases in ARB are also likely in the bogs that were not re-surveyed but no data is available. Another four non-designated BnM bogs (Kellysgrove, Netown/Loughgore, Bracklin (Ballivor) and Cornaveagh (Blackwater)) were surveyed in the period 2016-18 and estimated to support 6.0 ha of ARB. The extent of ARB on all these sites was taken as having remained broadly stable during the reporting period.
- One bog in SAC (002201) with 0.2 ha of ARB was identified by Coillte LIFE surveys in 2015.
- Fernandez & Eakin (in prep.) undertook an “exhaustive visual assessment” of high-resolution aerial images (from the 2013-16 period) and identified potential records of ARB on nearly 70 new bogs. The extent of ARB on 74 sites was estimated in this manner, *i.e*. no ground surveys were undertaken. For most of these sites, a nominal figure of 0.25 ha was given, as a minimum amount of ARB likely to be present. The estimate of ARB on 11 of these sites was updated during this project either through analysis of aerial photos or ground surveys. The remaining 63 sites were confirmed to still be present, through analysis of aerial photos, but were not assessed in any other way. The estimated area of ARB on these 62 sites is 21.5 ha. The actual extent is likely to be higher but is also likely to have declined since 2018.

The figures given above are given below in Table 3 under Unaltered data from Fernandez and Eakin (in prep.) and used here unassessed to estimate the overall extent of ARB in the country in 2024.

Table 3 Estimated national extent of ARB in Ireland in 2024 and the category of data the estimate was derived from.

Category of data				ARB (ha)	
	Type	**No. of bogs**	**Source**		
Recent (2019-24) Survey Data	Ecotope survey	64	MARBMP, EMP, LB, BnM, FKW & ABP (sec. 3.1.1.1)	925	
	Walkover survey	4	See Appendix 6	6	
	Cutover survey	9	See Appendix 8	6	
	Total	**77**			**937**
Desktop Analysis of old data	Desktop update of data	95	See Appendix 7	327	
	Total	**95**			**327**
Other data (mainly ecotope data from 2010-18)	Ecotope surveys	20	Fernandez et al. (2014)	291	
	Ecotope surveys	17	Crushell *et al*. (2019)	155	
	Ecotope surveys	1	Living Bog (2017 survey)	73	
	Ecotope surveys	3	Article 6.3 NPWS (2015-18 surveys)	8	
	Walkover surveys	4	NPWS (2015-18 surveys)	16	
	Ecotope survey	10	BnM (2010-17 surveys)	14	
	Walkover surveys	1	Coillte (2015 survey)	0	
	Desktop assessment	62	Fernandez & Eakin (in prep.) using 2013-16 imagery	22	
	Total	**118**			**579**
Total National Estimate of ARB					**1,843**

3.1.2 Habitat distribution

The new distribution map differs slightly from the one reported in 2019, where a total of 113 10 km grid cells were considered to intersect areas containing ARB. New data gathered in the current reporting period shows that a total of 118 cells intersect habitat records. ARB was likely lost from one cell (R89) in Tipperary due to peat exploitation during the reporting period. All other differences are due to either improved knowledge or the recognition that ARB can also occur on cutover.

Improved knowledge (through survey work) established that ARB was unlikely to be present in a cell (N25) in Longford, acknowledging that it was also unlikely to have been present in 2019. New records of ARB were recorded from two cells in Tipperary (S25 and R98; Crushell *et al*., 2022, 2023) and one in Kilkenny (S27; Foss *et al*., 2020). These three new records are a result of better knowledge of the habitat's distribution (through field surveys), rather than an actual increase in habitat distribution. ARB was also newly recorded on cutover bog from one cell in Tipperary (S14; Crushell *et al*., 2024b), one cell (N38) in Longford (NPWS, 2023), one cell in

Leitrim (G94; Crushell *et al*., 2024d) and one cell in Clare (R66; O'Loughlin, 2022). These four new records were also the result of better knowledge of the habitat's distribution (and recognition that ARB can also occur on cutover) rather than an actual increase in habitat distribution.

In addition to the likely loss of ARB from one 10 km grid cell having occurred during the reporting period, further losses in the future appear likely. For example, if turf cutting continues at current levels, ARB is in danger of disappearing in the short-term (*c.* 2-4 reporting periods) from the following cells: N05, N21 and N53. In the longer term, other cells where ARB is in danger of being lost, if turf cutting activities continue at current rate, include M73, R98 and S25.

3.1.3 Habitat Range

The figure for ARB Range was calculated based on the Range Tool generated by EIONET. The RT tool produced two automated shapefiles following the RT algorithm. The automated output was double checked using expert knowledge and the shapefile showing the current distribution for the habitat was manually updated. Subsequently, the RT tool was run again using the manually updated current distribution shapefile, producing a current range distribution shapefile.

The Current Range (CR) is 19,400 km^2 (194 10 km grid cells) (see Figure 1) and differs from the one reported in 2019, which was 17,300 km^2 (173 10 km grid cells). This increase in CR value is the result of better knowledge of ARB distribution and a recognition that ARB can also occur on cutover. There has been no actual change in habitat Range during the reporting period.

3.1.4 Habitat Favourable Reference Range

The habitat FRR was defined as the current range of DRB in 2019 by Fernandez and Eakin (in prep.) since the definition of DRB in the Habitats Directive Interpretation Manual (CEC, 2013) is that DRB should be capable of regeneration to ARB in 30 years, if appropriate measures are put in place.

The definition of habitat FRR has now been updated to reflect the recent understanding that ARB can also occur on cutover, whereas DRB is as yet defined as not occurring on cutover. Thus, the habitat FRR is now defined as the current range of DRB plus the current range of ARB.

The FRR for ARB is 22,600 km^2 (226 10 km grid cells) (see Figure 1) and differs from the one reported in 2019, which was 21,700 km^2 (217 10 km grid cells). This increase in FRR value is the result of better knowledge of ARB distribution and a recognition that ARB can also occur on cutover. There has been no actual change in habitat FRR during the reporting period.

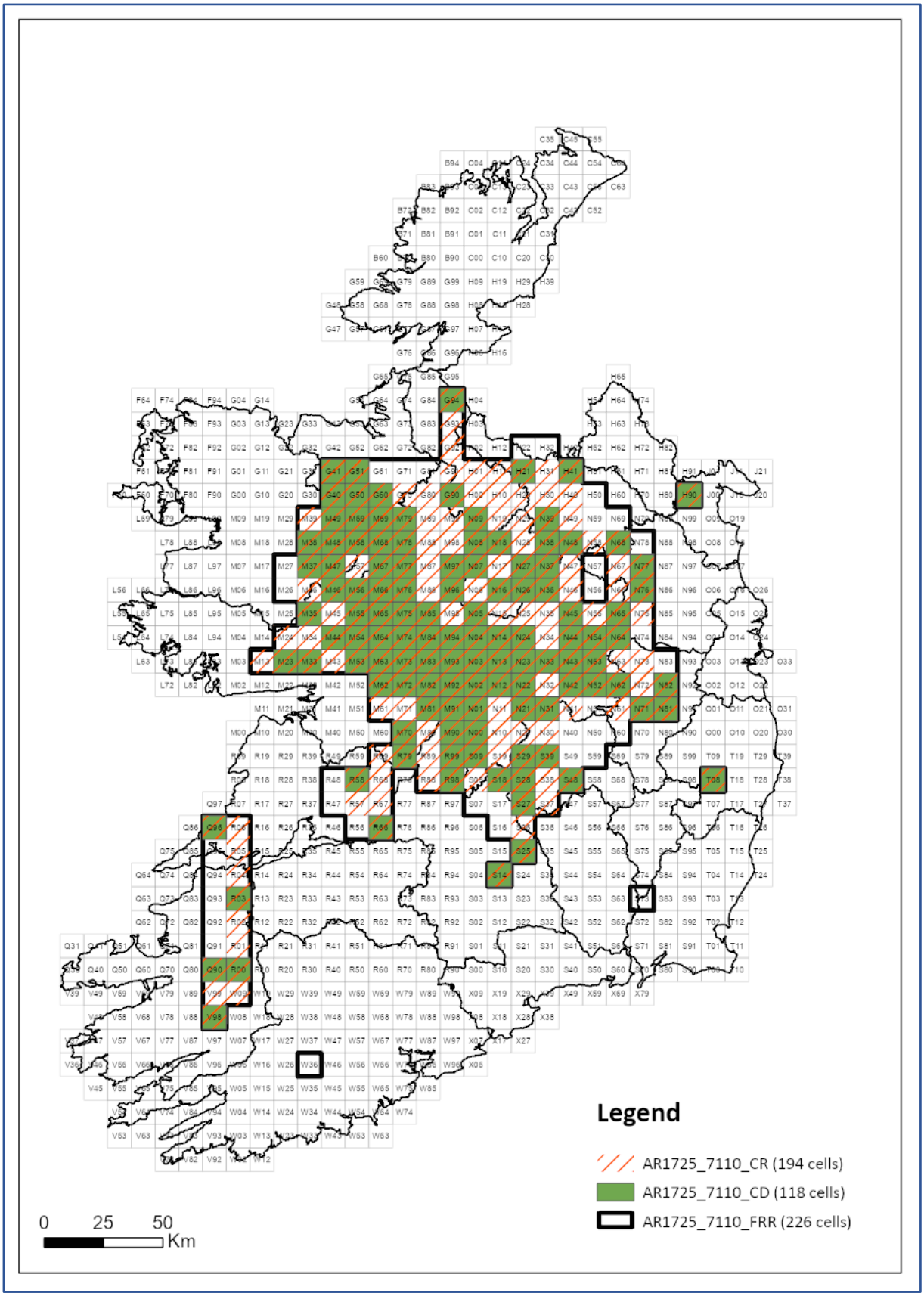


Figure 1 Current Distribution (CD), Range (CR) and Favourable Reference Range (FRR) of ARB in Ireland.

3.2 DRB habitat mapping

3.2.1 Habitat distribution

The new distribution map differs slightly from the one reported in 2019, where a total of 156 10 km grid cells were considered to intersect areas containing DRB. New data gathered in the current reporting period also show a total of 156 cells intersect DRB records, but with a slightly different distribution.

From analysis of aerial photography DRB was potentially lost from one cell (S49) in Laois due to peat exploitation during the reporting period. All other differences are due to improved knowledge in the distribution of the habitat with, for example, survey work establishing that DRB is likely present in two additional cells in Tipperary (S25) and Kilkenny (S27). DRB was likely already present in these cells in 2019.

As little to no eco-hydrological modelling work was undertaken in the 2019-24 period, the DRB dataset is largely unchanged and may not fully reflect any changes in DRB distribution. In addition to the potential loss of DRB from one 10 km grid square having occurred during the reporting period, further losses in the future appear likely. For example, if turf cutting continues at current levels at the following sites, DRB is in danger of being lost in the short-term future (*c.* 2-4 reporting periods) from the following cells: M99, G91, N32 and N74.

3.2.2 Habitat Range

The figure for DRB Range was calculated using the same methods as described for ARB in section 3.1.3.

The Current Range (CR) is 22,200 km^2 (222 10 km grid cells) (see Figure 2) and differs from the one reported in 2019, which was 21,700 km^2 (217 10 km grid cells). This increase in CR value is the result of better knowledge of DRB distribution. There has been no actual change in habitat Range during the reporting period.

The reported CR does not include cells only containing secondary DRB records, nor does it include cells where only small (generally <30 ha) remnant areas of high bog, with little restoration possibilities, were present. Nevertheless, additional records of “intact” high bog supporting DRB may be also present within the secondary DRB dataset. Thus, it cannot be ruled out that the actual Area, distribution and Range of DRB may be slightly larger than the one illustrated by the figures above and shown in Figure 2.

3.2.3 Habitat Favourable Reference Range

The national targets for ARB and DRB require that all DRB in the country is restored to ARB and thus the Favourable Reference Value for DRB is 0 ha. This FRV is unchanged from the last reporting period.

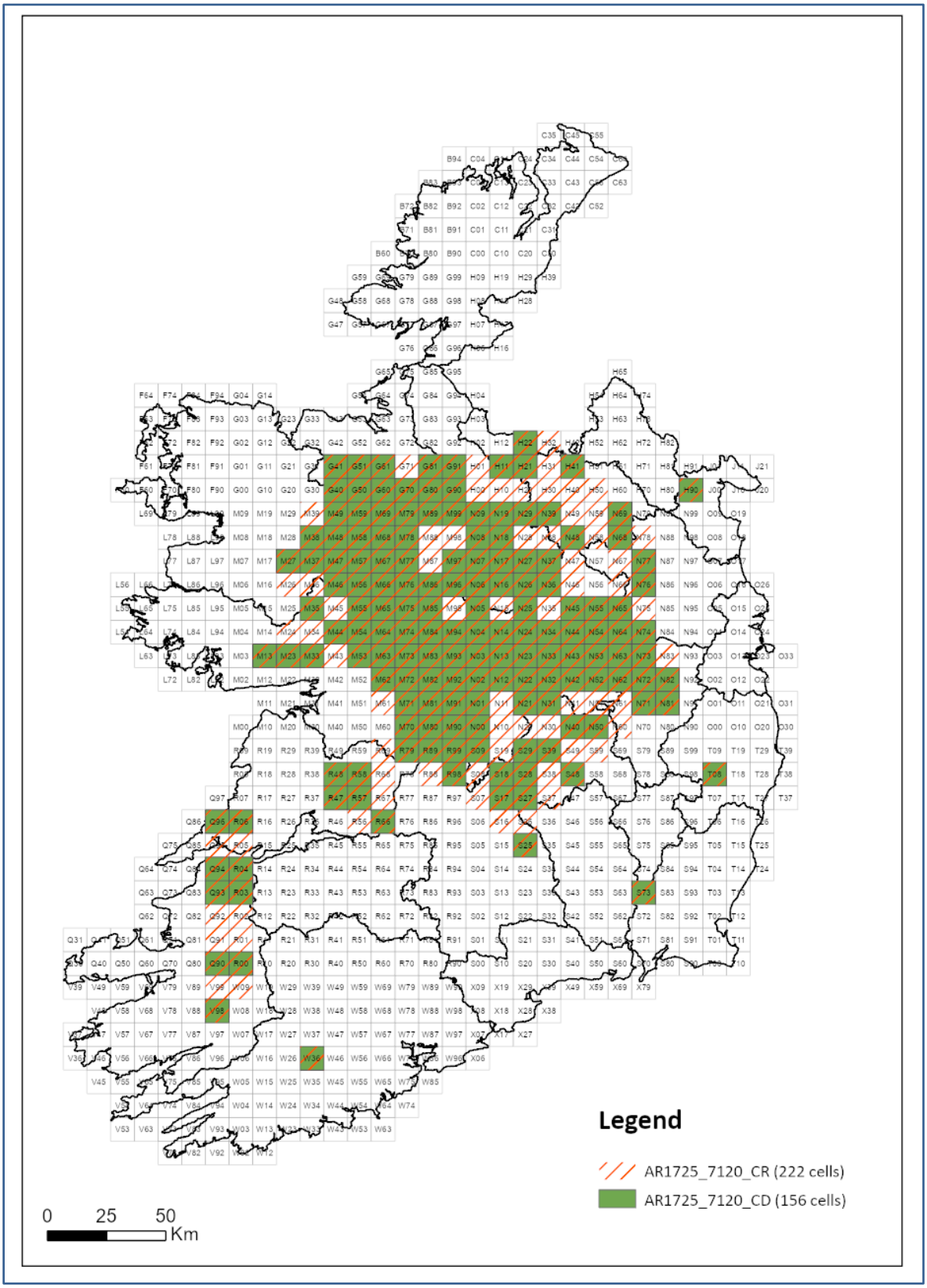


Figure 2 Current Distribution (CD) and Current Range (CR) of DRB in Ireland. Note that the Favourable Reference Range (FRR) of DRB is zero as the objective is to restore all DRB to ARB.

3.3 Pressures and threats assessment

The following section of the report describes the most negatively impacting and threatening activities currently affecting ARB (and DRB), as well as providing a summary of previous periods of assessment.

A summary of the impacting activities/pressures recorded across the 46 bogs for which a conservation condition assessment was undertaken during the reporting period (2019-24) is given in Table 4. Further detail on a site-by-site basis is given in Appendix 12, and each pressure/threat is discussed in more detail in the sections below. The approach to ranking the pressures and threats followed the following general logic (additional detail is given in Appendix 9):

- High indicates that the extent of ARB on the high bog is impacted or threatened and the pressure/threat is preventing ARB targets on the high bog from being achieved.
- Medium indicates the extent of peat-forming habitat on the cutover is impacted or threatened and the pressure/threat is preventing ARB targets on cutover from being achieved, and/or the S&F of ARB on the high bog is impacted or threatened.
- Low indicates that pressure or threat is likely having some influence on ARB, peat-forming habitat on the cutover or the supporting habitat

Table 4 Summary of impacting activities/pressures recorded across the 46 bogs for which a conservation condition assessment was undertaken during the reporting period (2019-24). The table shows the number of bogs for which a pressure was ranked as having a high, medium or low influence.

Pressure/Threat Code and Name	High	Medium	Low
PL02 Drainage	23	0	8
PC05 Peat extraction (includes associated drainage)	14	1	0
PB24 Drainage for forestry	9	8	7
PB01 Conversion to forest from other land uses, or afforestation (excluding drainage)	9	7	5
PK04 Atmospheric N-deposition	4	19	23
PH08 Other human intrusions and disturbance (burning)	4	2	2
PA22 Drainage for use as agricultural land	3	7	4
PJ01 Temperature changes and extremes due to climate change	0	19	27
PJ03 Changes in precipitation regimes due to climate change	0	19	27
PA01 Conversion into agricultural land (excluding drainage and burning)	0	5	3
PI02 Other invasive alien species (other than species of Union concern)	0	1	15
PI03 Problematic native species	0	1	4
PE01 Roads, paths, railroads and related infrastructure (and associated drainage)	0	1	0

3.3.1 PC05 Peat extraction (includes associated drainage)

3.3.1.1 Turf cutting

Traditional cutting of bogs over the last 400 years has had a serious impact on raised bogs and it has been estimated that 68% of their extent has been cut away by this process (Hammond, 1979; Ryan & Cross, 1984; Cross, 1990). However, the mechanisation of turf cutting from the mid-20th century onwards accelerated the destruction of the habitat.

Turf cutting continues today both in designated and non-designated sites. During the current reporting period, turf cutting (or associated drainage) was reported from 15 (Table 4 and Appendix 12) of the 46 bogs (32.6%) for which a conservation condition assessment was undertaken. Information from NPWS for SACs, as well as analysis of aerial photography for NHAs proposed for retention and for de-designation indicates that approximately 76 of the 139 (54.7%) designated raised bogs that were assessed by Fernandez *et al*. (2006) were cut during this reporting period (2019-24). This compares favourably with the 84.2% (117 of 139) of these designated bogs reported as being cut in the mid-2000s by Fernandez *et al*. (2006) and the 70.5% (31 of 44) of the sub-set of these bogs assessed as being cut by Fernandez *et al*. (2014) for the period 2005-12.

Information from NPWS suggests that 16 of the 62 SACs (26%) where ARB and/or DRB is a QI were cut in 2024, with an estimated total of 185 plots cut across these 16 sites (Table 5). This is down 39.9% from the estimated 308 plots cut across 22 SACs at the end of the last reporting period in 2018. The average number of plots cut per year across the SAC network decreased by 15.5% when comparing the current reporting period (average of 264.2 plots cut per year from 2019-24), to the previous reporting period (average of 312.8 cut per year from 2013-18). The average number of SACs cut per year has also decreased by 35.5%, from an average of 25.3 sites per year in the last reporting period to 16.3 during the current period.

Table 5 Number of SACs and number of plots cut within the SAC network each year from 2012-24.

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Sites	28	26	27	26	28	23	22	16	16	19	17	14	16
Plots	456	255	318	321	335	340	308	295	286	290	326	203	185

While exact figures for the number of plots cut are not available for the NHAs, 13 of the 36 NHAs proposed for retention were cut during the current reporting period (See Table 6). This was a 38.1% decrease from the estimated 21 cut during the last reporting period. A decrease in the intensity of cutting has also been recorded, with none of the sites cut during the current reporting period considered to have higher than moderate amounts of cutting. There has been no change in the number of proposed NHAs cut since the last reporting period with 13 of the 25 sites cut in both reporting periods. However, the figures do show a very slight decrease in the intensity of the cutting on these sites. Similarly, for the NHA sites proposed for de-designation there has been no change since the last reporting period, with 45 of the 46 sites cut in both reporting periods. The figures in Table 6 show almost no change in the overall intensity of the cutting on these sites. No figures or estimates are available for non-designated sites, but domestic cutting is likely to have continued. Furthermore, the high amount of associated drainage (see section 3.3.1.2 and

Appendix 13) inserted on non-designated high bogs during the reporting period indicates that peat exploitation on some non-designated sites is high, and potentially of a commercial nature.

One clear positive change across non-designated bogs is the decision of BnM to cease peat cutting, with the company's last full peat harvest taking place in 2018, followed by a partial harvest in 2019 and a full suspension of harvesting operations in 2020. Further positive change is also anticipated as a result of the recent work undertaken by the Environmental Protection Agency (EPA) in halting commercial peat harvesting operations.

Table 6 Cutting intensity within NHAs proposed for retention, NHAs proposed for designation and NHAs proposed for de-designation. Cutting intensity assessed (from aerial photography and using information from NPWS) in the current reporting period (2019-24), the previous reporting period (2013-18) and figures taken from the NHA review (NPWS, 2014). Cutting intensity was ranked as follows: Estimated number of plots cut: 0 = Absent (Abs); 1-5 = Very Low (VL); 6-14: Low (L); 15-29: Moderate (M); 30-49: High (H); ≥50: Very High (VH).

Designation	Year	Very High	High	Moderate	Low	Very Low	Absent
NHAs proposed for retention (36)	Reporting period (2019-24)	0	0	4	0	9	23
	Previous period (2013-18)	0	1	3	9	8	15
	NHA review (2007-14)	0	2	8	13	6	7
NHAs proposed (25)	Reporting period (2019-24)	0	2	2	3	6	12
	Previous period (2013-18)	0	2	3	3	5	12
Proposed for de-designation (46)	Reporting period (2019-24)	15	10	12	6	2	1
	Previous period (2013-18)	16	11	11	7	0	1
	NHA review (2007-14)	23	11	6	4	1	1

Overall, while there has been a reduction in the amount of turf cutting that is impacting on the ARB resource, cutting is ongoing on raised bog habitat both in designated and non-designated sites. Schemes such as the Cessation of Turf Cutting Compensation Scheme (CTCCS) have helped reduce turf-cutting impacts on ARB. Established for SACs in April 2011 and extended in 2014 to NHAs proposed for retention, the CTCCS compensates landowners and holders of turbary rights affected by turf-cutting restrictions. As an alternative to financial compensation, the Turf Cutting Relocation Programme enables turf cutters to move from plots within designated sites to nearby non-designated bogs, where they can continue sourcing turf for domestic use.

Based on the combination of the decreasing turf cutting activity trend and efforts put in place to reduce this pressure within SACs and NHAs proposed for retention, a decreasing trend in turf cutting activity within these designated sites is expected in the next two reporting periods.

3.3.1.2 Associated drainage

Where turf cutting continues, there is associated drainage and when the cutting ceases the drainage remains until restoration works are undertaken. Where turf cutting took place during the reporting period, associated drainage is reported here. Where turf cutting ceased prior to the beginning of the reporting period, drainage is

reported under the activity code “PL02 Drainage”, which is described below in section 3.3.2.

During the reporting period, very little new turf-cutting-related drainage was installed on raised bogs designated as SACs or on NHAs proposed for retention. The exceptions were short drains installed on the high bog at Clooncraff/Cloonlarge Bog within Lough Ree SAC 000440 in the late 2010s, and the continued extension of cutover drains towards the facebank where turf cutting persists.

However, extensive drainage was inserted during the reporting period on some of the NHAs that are proposed for de-designation such as

- the south-western section of Rinn River NHA 000691 in the townlands of Annaghcooleen and Clooniher, where an extensive network of drains has been inserted across approximately 6 ha of high bog. These drains were inserted in the late 2010s and early 2020s and go through an area that was mapped as ARB in the most recent ecotope map of the site which was produced in 2003 (Fernandez *et al*., 2006).
- Ballinderry Bog in the south-west of Ballynagrenia and Ballinderry Bog NHA 000674 where short (*c.* 50 m) linear drains have been inserted in the early 2020s into the bog from the margin every *c*. 10 m across almost the entire circumference of the bog. In places these drains cut into what was mapped as ARB in the ecotope survey of 2000 by Derwin and MacGowan (2000). Approximately 6 ha of the margin of the high bog now have these parallel drains and these are potentially impacting on most of the 40 ha of high bog that remains.
- the northern section of Killaclogher Bog NHA 001280. Although a network of drains was already present here at the beginning of the reporting period, the number of drains appears to have approximately doubled during the reporting period. The extent of the drainage network here implies that the peat exploitation may be of a commercial nature.

Any ARB that was present on these sections of bog is likely to have been highly impacted on in a negative manner by such drainage works. New, though less extensive high bog drains have been inserted on other NHAs proposed for de-designation during the reporting period such as Hodgestown Bog NHA 001383. An extensive series of high bog drains were also inserted in the early 2020s on the south-east of one of the sites proposed as an NHA (pNHA 000783) by the NHA review. The network of drains here covers approximately 8 ha of high bog with parallel drains occurring every *c*. 20 m. These drains continue on to the cutover where extensive drainage works have also occurred during the reporting period.

No data is available for non-designated sites, but it is clear from analysis of aerial photos that extensive high bog drainage has been inserted in several sites. See Appendix 13 for details of 14 different sites where a high intensity of such impacts has been noted.

In contrast, an extensive restoration programme (NPWS National Raised Bog Restoration Programme) has been ongoing across the designated network of sites with drain blocking occurring on 22 SACs and 9 NHAs during the reporting period. By November 2024, a total of 1,566 km of drains have been blocked as part of these works with 525 km having been blocked during the reporting period (see section 3.4 Conservation Measures and Appendix 14 and 15 for further details). Further works are scheduled to take place in late 2024 and will continue in 2025 and beyond. On non-designated sites BnM are continuing a restoration programme across a number

of their deep-peat bogs, on which ARB is likely to expand or develop over the coming years.

Based on the above, a decreasing trend in drainage associated with turf cutting activity within these designated sites is expected in the next two reporting periods.

3.3.2 PL02 Drainage

In previous reporting periods, all drainage whether associated with turf cutting or not was reported under this heading. However, for this reporting period, the drainage reported on under PL02 relates to drainage not associated with turf cutting or to drainage that may have been associated with turf cutting in the past, but where no cutting took place during the reporting period. During the current reporting period drainage was reported under PL02 from 31 (Table 4 and Appendix 12) of the 46 bogs (67.4%) for which a conservation condition assessment was undertaken. Drainage was also reported from the other 15 bogs but was recorded under PC05 (Peat extraction including associated drainage). Of the 31 bogs, the impact of drainage was estimated to be high on 23 of these, 15 of which have not undergone any restoration works. The impact of drainage was estimated to be low on eight of the 31 with all eight having undergone substantial restoration works, which has reduced the impact of drainage on these sites.

Based on the above, a decreasing trend in drainage within these designated sites is expected in the next two reporting periods.

3.3.3 PK04 Atmospheric Nitrogen Deposition

During the last reporting period Fernandez and Eakin (in prep.) recognised the potential negative impacts associated with air pollution and, particularly, nitrogen concentration and deposition. It was also noted that changes in air quality, particularly towards the eastern extent of the range of raised bogs, is likely to have had an impact on ARB, and that any further deterioration in air quality has the potential to become a significant risk to raised bogs in Ireland. Air quality targets were set for each raised bog SAC when the site-specific conservation objectives were set, though it was recognised that further investigations and monitoring to understand the impacts of nitrogen deposition on raised bog habitats was needed.

The impact of atmospheric nitrogen pollution in ombrotrophic bogs in mainland Europe has been well documented by studies such as Tomassen *et al.* (2004), where it has been implicated in the invasion of bogs by *Molinia* and *Betula*. While Ireland has, until recently, had low levels of atmospheric nitrogen pollution, it has experienced continuously increasing emissions of ammonia since 2011 (Kelleghan *et al*. 2019), exceeding the limits set by the EU National Emission Reduction Commitments (NEC) Directive (2016/2284) (European Union 2016) for the first time in 2016 (EPA, 2018). Note that it is the Department of Climate, Energy and the Environment, which is the parent department responsible for the implementation of the EU NEC Directive and that it is the EPA, which is the national authority for monitoring and reporting under this Directive.

Nitrogen deposition can be separated into two broad types; dry deposition as ammonia (NH_3) and wet deposition following conversion to ammonium (NH_4). Agriculture is the dominant source of these emissions (Kelleghan *et al*., 2019, 2021) and arguably this pressure could be reported under PA20 Livestock farming generating pollution, but more research is needed.

Kelleghan *et al*. (2019, 2020) modelled over 90% of Ireland's raised bog SACs as being above Critical Levels for atmospheric ammonia. The Critical Level for ammonia

is a pan-European threshold recommended by the United Nations (UNECE, 2007). The Critical level for ammonia is 1 µg NH_3 m^{-3} for raised bogs as these are ecosystems where lichens and bryophytes are a significant component. Where the annual average ambient ammonia concentration is above this level, visible impacts on habitats and species can be expected. The SSCOs published by the NPWS for each SAC refer to critical loads rather than critical levels. Kelleghan *et al*. (2022) note that the application of critical loads is more complex compared to critical levels, because it is inclusive of wet/dry deposited ammonia and ammonium, and wet/dry deposited oxides of nitrogen (Aherne *et al*., 2017). A critical load is defined as a deposition rate below which, significant harmful effects do not occur "according to present knowledge" (Posthumus, 1988). They are intended to account for long term effects and resilience of ecosystem function. The critical load of 5-10 kg N/ha/year assigned to raised bogs is based on work by Bobbink & Hettelingh (2011). A study of five raised bog sites as part of a larger study on the levels of nitrogen deposition on Ireland's SAC network by Kelleghan *et al*. (2021) found that all five sites exceeded the higher band of the critical load range (10 kg N/ha/year) with rates of 10.1-17.32 kg N/ha/year.

Kelleghan *et al.* (2022) recently reported on the identification and assessment of potential impacts of agricultural atmospheric ammonia. The following were given as indications of impacts of ammonia and nitrogen:

- Algae: a proliferation of green algal slimes on trees, other plants (*e.g*. Heather), moss and lichens.
- Indicator lichens: the presence of lichen species such as *Xanthoria parietina* are indicative of ammonia pollution.
- *Cladonia portentosa*: this lichen can turn pink as a result of ammonia and light exposure in combination, followed by breakdown and loss of structure.
- Decay of *Sphagnum*: patches of decaying *Sphagnum* species (brown/dark green and slimy).
- Vascular plants: bleaching, stunted growth, exacerbated fungal and frost damage to heather species most notably *Calluna vulgaris*, increase in tall vegetation.

During the conservation condition assessment of the 46 bogs undertaken between 2021-24, the impacts of nitrogen were assessed largely through the use of the modelling carried out by Kelleghan *et al*. (2019, 2020) and by the online Air Pollution Information System app (https://www.apis.ac.uk/app), but also by field observations recorded while undertaking ecotope surveys. Unless field observations indicated otherwise, bogs were assessed as follows:

- No impact where bog modelled as having a concentration of ammonia < 1 µg NH_3 m^{-3}
- Low impact where bog modelled as having a concentration of 1-2 µg NH_3 m^{-3}
- Medium impact where bog modelled as having a concentration of 2-3 µg NH_3 m^{-3}
- High impact where bog modelled as having a concentration of >3 µg NH_3 m^{-3}

Table 4 (and Appendix 12) indicates all 46 bogs were assessed as being impacted by nitrogen to some degree with 23 bogs considered to be suffering from a low impact, 19 from a medium impact and four bogs from a high impact. On these four bogs (within three SACs), the ammonia concentration estimated by the APIS app accessed on 31/07/2024 was 2.6 µg NH_3 m^{-3} in the two Tipperary SACs (Ballyduff

and Clonfinane Bog SAC 000641 and Kilcarren and Firville SAC 000647) and 2.7 µg NH_3 m^{-3} in the Westmeath/Meath SAC (Mount Hevey SAC 002342). However, during the ecotope survey of four of the bogs (Ballyduff Bog, Clonfinane Bog, Firville Bog and Mount Hevey Bog), the impact was upgraded to high on the baisis of field evidence with indicators of potential impacts of atmospheric ammonia recorded in abundance such as:

- Bleaching/discolouration of foliose *Cladonia* species
- High cover of dead *Calluna* stems
- *Sphagnum* hummocks degrading and breaking down
- An abundance of *Odontoschisma sphagnii* (this has been reported as being a possible indication of ammonia pollution)
- High amounts of algal growth on *Calluna* stems
- *Xanthoria* lichen species on birch
- High cover values of *Sphagnum tenellum* (this has been reported as being a possible indication of ammonia pollution)

The source of ammonia may be related to intensive agriculture in the surroundings. The CCA of Kilcarren and Firville SAC was the first to consider that nitrogen may have played a role in the decreasing extent and declining quality of Active Raised Bog (ARB) in a raised bog SAC in Ireland. This, together with the CCA of Ballyduff and Clonfinane Bog SAC was the first in which the Future Prospects of ARB was considered to be negatively impacted upon by ammonia.

Of the 19 sites where nitrogen was ranked as having a medium impact, similar though not as extensive evidence was recorded during the ecotope surveys on Shankill West Bog (SAC 000326) in County Galway and Ardagullion Bog (SAC 002341) in Longford. On Shankill West Bog, the ammonia concentration estimated by the APIS app accessed on 06/08/2024 was 1.9 µg NH_3 m^{-3} while on Ardagullion Bog it was estimated at 2.4 µg NH_3 m^{-3}. Further research on the levels of nitrogen and the associated impact on raised bogs is ongoing as part of the National Ecosystems Monitoring Network (NEMN). This was established as a response to the EU NEC Directive (2016/2284), which requires every Member State to monitor the impacts of air pollution on sensitive ecosystems within its territory (EPA, 2024). NEMN, which focuses on atmospheric NH3 and other nitrogen-containing pollutants is coordinated by the EPA and is reliant on input from various partners including NPWS, Department of Agriculture, Food and the Marine and Met Éireann.

Two schemes launched during the reporting period by the Department of Agriculture, Food and the Marine (DAFM) are likely to have benefits in regard to reducing ammonia deposition adjacent to raised bog sites. These are the Low Emission Slurry Spreading (LESS) Scheme and the Agri-Climate Rural Environment Scheme (ACRES) and are discussed in section 3.4.7.

Overall, it is estimated that the impacts of nitrogen on ARB and DRB has increased during the reporting period both within and outside of the proposed network of designated sites. It is believed the DAFM schemes listed above will, at least, have some effect in limiting any future increase in the impacts of nitrogen on ARB and DRB and thus a stable trend in the impacts is expected (provided the uptake of these schemes adjacent to raised bogs is high) in the next two reporting periods. However, an increasing threat from nitrogen on ARB and DRB is possible and the trend needs to be re-assessed once further monitoring is undertaken and results from NEMN are analysed.

3.3.4 PB Forestry

3.3.4.1 PB01 Conversion to forest from other land uses, or afforestation (excluding drainage)

This includes plantations that were planted before and during the reporting period that are impacting ARB. During the current reporting period PB01 was reported as an impact on 21 (Table 4 and Appendix 12) of the 46 bogs (46%) for which a conservation condition assessment was undertaken. On nine of these bogs (20%) the impact was estimated to be high, on seven (15%) as medium, and on five as low (11%).

The restoration plans drawn up for SACs and the 36 NHAs proposed for retention in the mid-2010s identified conifer plantations that were likely impacting on ARB, and proposed removing these plantations, and blocking associated drains. The total amount of conifer plantations within these designated sites amounted to 722.4 ha (387.7 ha within SACs and 334.7 ha in NHAs). Plantations (totalling 428.9 ha) across 22 SACs and 22 NHAs were identified as being necessary to remove in order for sites to achieve Favourable Conservation Status (Table 7 and Appendix 16).

Table 7 Area of conifer plantations identified by restoration plans as being necessary to remove from within SACs and the 36 NHAs proposed for retention.

	SAC	NHA	Total
High Bog	62.1	145.1	207.2
Cutover	108.8	112.9	221.7
Total	**170.9**	**258.0**	**428.9**

Very few conifer plantations were removed during the reporting period, with one small area (0.5 ha) removed on Carrownagappul SAC 001242 as part of The Living Bog works and another (0.3 ha) on Cloncrow Bog NHA 000677 as part of CarePeat (an Interreg North-West Europe international research and conservation project that ran from 2019-2023 and involved five countries). A 4.5 ha plantation on the southern cutover of Scohaboy NHA 000937 was also expected to be removed by Coillte in late 2024/early 2025. The slow progress in the removal of conifer plantations may in part be due to legal constraints (*e.g.* there is an obligation to replant an area within two years of a plantation being felled), which currently exist when undertaking forest to bog projects.

There have, however, been a small number of areas in and around designated sites planted during (or immediately prior to) the reporting period (this is an approximation, as the exact year of planting was not available) such as a new *c.* 7 ha plantation (and associated drainage) immediately north of Brown Bog SAC 002346. This appears to have been planted in two phases, one in the early 2010s and another in the mid-late 2010s and is within *c.* 150 m of high bog. On Killure Bog NHA 001283, which is proposed for de-designation, a *c.* 80 ha plantation on high bog was removed and then replanted, in a number of phases, in the early and mid-2010s. Adjacent to the proposed NHA 000870 a *c.* 8 ha area was planted in the mid-2010s, which is adjacent to the high bog. A *c.* 12 ha area adjacent to the north-west of the high bog at one of the bogs within the pNHA 000873 was planted in the mid-late 2010s. A *c.* 5 ha area adjacent to the west of pNHA 000895 was planted in the mid-late 2010s, within 100 m of the high bog, with much larger areas planted in the earlier 2010s.

Peat soils have been offered some protection from forestry through the Afforestation Scheme 2023-2027 (DAFM, 2024). As part of this scheme, where there is >30 cm of peat, only native forest types will be considered, and then only where no new drainage is needed.

Overall, it is estimated that the impacts of forestry on ARB and DRB have remained relatively stable during the reporting period within SACs and NHAs proposed for retention. With the continued roll-out of restoration measures within these designated sites, the impacts from forestry are expected to decrease in the next two reporting periods.

3.3.4.2 PB24 Drainage for forestry

All conifer plantations have associated drainage, and this can continue to impact ARB after conifers are removed. Furthermore, the drainage associated with conifer plantations can make restoration difficult, as unless enhanced measures are undertaken, the ridge and furrow modification of the surface remains as a legacy, giving drier-loving non-bog plants as well as conifer and birch, a niche to re-colonise. Once these begin to grow, they contribute to lowering the water table in the area once again. Much of the conifer plantations removed as part of Coillte's LIFE projects from 2004 to 2015 will thus develop into birch woodland rather than open bog. Enhanced measures can be used to combat this, and during the reporting period, the method of stump flipping (Cushnan *et al*., 2022) was trialled on a conifer plantation on Carrownagappul Bog SAC 001242 in 2021, and cell bunding was constructed on Carn Park SAC 002336 in 2024 within a former Coillte LIFE area. See section 3.4.4 for further details.

Overall, it is estimated that the impacts of drainage for forestry on ARB and DRB have remained relatively stable during the reporting period within SACs and NHAs proposed for retention. With the continued roll-out of restoration measures within these designated sites, the impacts from forestry are expected to decrease in the next two reporting periods.

3.3.5 PA22 Drainage for use as agricultural land

This pressure/threat is included where drainage works (associated with agriculture) were noted during the reporting period, that are likely to impact conservation targets, or where NPWS site-specific restoration plans indicate that drainage associated with agriculture is impeding a site from achieving conservation targets.

During the current reporting period, PA22 was reported as potentially impacting on ARB in 18 of the 46 bogs (39%) assessed in Table 4 and Appendix 12. There was no detectable impact on Annex habitats estimated on four of the 18 bogs, a low impact estimated on four, a medium impact on seven and a high impact on three bogs (Raheenmore Bog SAC 000582, Derrinea Bog SAC 000604 and Shankill West Bog SAC 000326). It is difficult to estimate the impact of this activity, and further investigations are necessary to refine the assessment. The 14 sites where the impact was ranked as low, medium or high are listed in Appendix 12. Drainage works for agriculture took place within the reporting period on ten of these 14 sites, and the impact on ARB was at least partially attributable to the recent works. The impact of this pressure on the other four sites (Clara Bog SAC 000572, Derrinea Bog SAC 000604, Ferbane Bog SAC 000575 and Shankill West Bog SAC 000326) was due to solely drainage works that occurred prior to the reporting period.

Restoration works took place on four of the 14 bogs where PA22 was assessed as having an impact on peat-forming habitat, during the reporting period (Raheenmore

Bog SAC 000582, Clara Bog SAC 000572, Ferbane Bog SAC 000575 and Mongan Bog SAC 000580). However, drains prescribed to be blocked on these bogs, as part of restoration plans, were not blocked, mainly due to difficulties in attaining landowner permission.

Fernandez and Eakin (in prep.) reported an increasing pressure from drainage activity (*i.e*. new drainage or drainage maintenance) on cutover or reclaimed agricultural land within 200 m of the high bog on designated sites. They also suggested that the implementation of Drainage Management Plans for designated sites can be expected to reverse this activity trend. No analysis of such agricultural drainage activity on non-designated sites has been undertaken during this reporting period, but this activity is likely to be increasing.

A number of schemes such as FarmPEAT (Farm Payments for Ecological and Agricultural Transitions) and ACRES (Agri-Climate Rural Environment Scheme) were launched during the reporting period, which may help address the issue of drainage around designated raised bog sites. These two schemes are discussed in sections 3.4.6 and 3.4.7.

Overall, based on the combination of activity trend and efforts put in place (*e.g*. lack of continuation of FarmPEAT or similar projects) to reduce it within SACs and NHAs proposed for retention, an increasing trend in agricultural drainage within these designated sites is expected in the next two reporting periods.

3.3.6 PJ Climate Change

Raised bogs have been identified as among Ireland's habitats most vulnerable to climate change. Donnelly *et al.* (2008) highlight that the longer, drier summers are expected to accelerate peat decomposition, while the habitat's Suitable Climatic Area (SCA) in Ireland is projected to decline by 32% by 2055 and 38% by 2075. Coll *et al.* (2013) project a marked contraction of the SCA around the Central Plain, with substantial losses and fragmentation at the southern edge of the distribution. They also indicate that the current protected network will need to adapt to these changes, and they state that restoration will improve the extent, integrity and resilience of the habitat. On the whole, Desmond *et al*. (2017) recognises that the potential impact of climate change on Ireland's peatlands remains highly uncertain. This is derived from the combined uncertainty in the projections for climate change itself, including the uncertainty in predictions for changing levels of precipitation and the lack of knowledge on the current vulnerability of much of Ireland's peatlands.

No detailed analysis of how climate change may impact on ARB at each individual site was undertaken during this project. However, considering the habitat is believed to come under more threat in the south and midlands areas of the habitat's extent, all bogs lying east of the Shannon and south of County Longford (19 of the 46 bogs assessed in Table 4 or 41%) were assessed as coming under a medium threat from climate change. Those west of the Shannon and/or north of County Longford (27 of the 46 bogs assessed or 59%) were assessed as coming under a low threat from climate change. Temperature changes (PJ01) and changes in precipitation regimes (PJ03) due to climate change were not assessed separately.

Although the pressure from climate change is expected to increase, an increase in resilience to the negative effects of Climate change is expected through the implementation of site-specific restoration plans at bogs within SACs and NHAs proposed for retention.

3.3.7 PH08 Other human intrusions and disturbance (burning)

All burning that impacts ARB or DRB is reported under this category. However, the cause of the fire is generally unknown. On the 46 bogs assessed in Table 4 (and Appendix 12), the impacts of fire were recorded on eight (17.4%) during the reporting period with three of the nine fires occurring prior to the reporting period. This compares favourably with the estimated 50% of the 48 bogs assessed that were impacted by fires in the 1994-2005 reporting period by Fernandez *et al*. (2005) and the 31.8% of the 44 bogs assessed that were impacted by fires in the 2007-12 reporting period by Fernandez *et al*. (2014). A total of *c.* 250 ha of high bog vegetation was burned across five bogs during the reporting period with a further 65 ha across three bogs burned in the year or two immediately prior to the reporting period. The activity is assessed as having a high impact on ARB on four bogs, medium on two and low impact on two of the bogs.

With the decrease in general activities (*e.g*. turf cutting, high bog drainage) within SACs and NHAs proposed for retention, an ongoing decreasing trend is expected for burning in these designated sites in the next two reporting periods. However, outside of the designated network, there is likely no change in impact trends from burning. An increase in resilience to the negative effects of burning is expected through the implementation of site-specific restoration plans at bogs within SACs and NHAs proposed for retention.

3.3.8 PI02 Other invasive alien species (other than species of Union concern)

Fernandez *et al*. (2014) reported *Pinus contorta, Rhododendron ponticum*, *Sarracenia purpurea* and *Campylopus introflexus* as the most common invasive species on raised bogs. During the current reporting period, invasive species were reported from 23 of the 46 bogs assessed in Table 4 and Appendix 12 with no detectable impact on Annex habitats estimated on seven of the 23 bogs, a low impact estimated on fifteen bogs and a moderate impact on one bog.

Rhododendron ponticum was the most common invasive species being reported from eighteen of the 46 sites, and was considered most problematic on Clooneen Bog SAC 002348. It was found to be locally abundant in some areas of the flush/bog woodland system in the north of the site and impacting the condition of the Bog Woodland (91D0) there. In general, on raised bogs, *Rhododendron* tends to be more of a problem on cutovers than on high bog and thus is more likely to impact on peat-forming habitats on the cutover than on ARB on the high bog.

Conifers, particularly *Pinus contorta,* were the next most common invasive reported from the high bog while *Sarracenia purpurea* was reported from only one of the 46 sites (Aghnamona Bog NHA 000422), where a dense but much localised population of the plant was recorded west of the centre of the high bog. This population had a small number of satellite populations around it.

Control of invasive species was reported from four (Clara Bog SAC 000572, Girley Bog NHA 001580, Cloncrow Bog NHA 000677 and Aughrim Bog NHA 001227) of the 46 bogs (Table 8 and Appendix 17) as well as from the non-designated Shanakyle Bog in County Clare. NPWS are also undertaking control of pine on other sites outside of the 46 that were part of this monitoring assessment, such as at Crosswood Bog SAC 002337.

There is no evidence of an increase in invasive species in the reporting period. Although invasive species are deemed to cause negative impacts in a relatively

limited number of sites, they are not in general considered a significant threat to raised bog habitats. In addition, the implementation of site-specific restoration plans within SACs and NHAs proposed for retention is likely to reduce the pressure from invasive species. An overall decreasing trend within these designated sites is expected in the next two reporting periods.

3.3.9 PI03 Problematic native species

During the current reporting period, problematic native species were reported from 10 of the 46 bogs (Table 4 and Appendix 12), with no detectable impact on Annex habitats estimated on five of the 10 bogs, a low impact estimated on four bogs and a medium impact on one bog. *Pinus sylvestris* and *Betula pubescens* are the only two species reported under this heading. Brown Bog SAC 002346 is the only site where a medium impact was estimated from problematic native species. Here, *Pinus sylvestris* is spreading on the high bog, and may be causing localised drying out. Although the impact on the high bog habitats requires further research, the spreading of *Pinus sylvestris* is likely to indicate further drying out processes, which in turn encourage the spread and growth of the species even further. As suggested, further research needs to be undertaken, as well as a monitoring and possibly eradication programme.

No control measures of problematic native species appear to have been undertaken during the reporting period.

There is no evidence of a significant increase in problematic native species in the reporting period. Although such species are deemed to cause negative impacts in a relatively limited number of sites, they are not in general considered a significant threat to raised bog habitats. In addition, the implementation of site-specific restoration plans within SACs and NHAs proposed for retention is likely to reduce the pressure from problematic native species. An overall decreasing trend within these designated sites is expected in the next two reporting periods.

3.3.10 Other impacting activities

PA01 Conversion into agricultural land (excluding drainage and burning) is included as a pressure/threat where NPWS site-specific restoration plans indicate that agricultural land is impeding a site from achieving conservation targets and/or where newly recorded reclamation works were considered likely to impact on achieving ARB targets at a site. Note that it includes areas that were already reclaimed for agriculture prior to the reporting period but are considered necessary to re-wet to achieve Favourable Conservation Status for the site. It was recorded on eight (17.4%) of the 46 sites assessed in Table 4 and Appendix 12 with a low impact on Annex habitats estimated on three bogs and a medium impact estimated on five. Although restoration works took place on three (Raheenmore Bog SAC 000582, Clara Bog SAC 000572 and Ferbane Bog SAC 000575) of the eight bogs during the reporting period, areas of these bogs prescribed to be potentially re-wetted as part of restoration plans were not, mainly due to difficulties in attaining landowner permission.

The impacts from PE01 Roads, paths, railroads and related infrastructure (and associated drainage) were recorded on one of the 46 bogs (Table 4 and Appendix 12), with a medium impact on the Annex habitats estimated, from drainage associated with the BnM rail line that runs close to the eastern boundary of Mongan Bog SAC 000580. Although restoration works were undertaken on the site during the

reporting period, 0.3 km of drain associated with the rail line that the Restoration Plan states should be blocked were not blocked in case it impacted the rail line.

Other impacts reported as impacting on raised bog Annex habitats in the past (Fernandez *et al*., 2014) such as quarrying (PC01 Extraction of minerals), were not recorded on any of the 46 bogs assessed but may continue to impact on sites where it was reported from in the past. Additional pressures, such as water abstraction, may also impact ARB on some sites, either within or outside of the designated network but were not recorded in this report.

3.4 Conservation Measures

The following section of the report details Conservation Measures undertaken during the reporting period with the aim of improving the conservation status of ARB.

A summary of the Conservation Measures recorded across the 46 bogs for which a conservation condition assessment was undertaken during the reporting period (2019-24) is given in Table 8. Further detail on a site-by-site basis is given in Appendix 17.

Table 8 Summary of Conservation Measures recorded across the 46 bogs for which a conservation condition assessment was undertaken during the reporting period (2019-24). Table shows the number of bogs for which the conservation measure was ranked as having a high, medium or low influence. MA14 is not included in the table as site-specific impacts of this measure have not been recorded.

Conservation Measure	High	Medium	Low
MC02 Adapt/manage exploitation of energy resources (control of turf cutting)	30	15	1
MC07 Habitat restoration/creation from resources, exploitation areas (drain blocking)	20	0	0
MK03 Restoration of habitats impacted by multi-purpose hydrological changes (enhanced restoration measures)	6	2	0
MB14 Manage drainage and water abstraction for forestry (inc. restoration of drained or hydrologically altered habitats)	2	4	1
MI03 Management, control or eradication of other invasive alien species	0	1	3
MA13 Manage agricultural drainage and water abstraction (incl. the restoration of drained or hydrologically altered habitats)	0	0	2

The most common management action is the control of turf cutting, which has had a positive impact on all 46 bogs during the reporting period. Positive impacts from physical restoration works (drain blocking) were recorded on 20 bogs (43.5%) with the works on 15 of these undertaken during the reporting period. Across the entire designated network of the 55 SACs designated for ARB and 36 NHAs proposed for retention, physical restoration works were undertaken on 31 (22 SACs and 9 NHAs) sites (34.1% of sites) during the reporting period. In total, physical restoration works have now been undertaken on 47 (51.6% of) designated sites (31 SACs and 16 NHAs). See Appendix 14 and 15 for details.

Site-specific conservation objectives (SSCO's) and restoration plans have been developed for SACs and the 36 NHAs proposed for retention. In addition, drainage management plans have been developed for all SACs and some NHAs. The drainage management plans help determine which elements of the drainage network

can be maintained without impacting on the conservation objectives. The restoration plans identify the restoration works needed for ARB to achieve Favourable conservation condition on a site-by-site basis. Physical restoration works on each site can comprise several different measures such as drain blocking, bund construction and conifer removal. Progress on each of these measures is described in detail in the sections below. An overall assessment of the progress of the implementation of proposed measures is given in Table 9 (and Appendix 18 and 19), which highlights that hydrological restoration works have been completed on 28.5% of the area within the 62 SACs designated for ARB and/or DRB and 22.8% of the area within the 36 NHAs proposed for retention.

Table 9 Summary of the extent of hydrological restoration undertaken to date (November 2024) within the 62 SACs designated for ARB and/or DRB and the 36 NHAs proposed for retention, measured against the total proposed are to be restored in the site-specific restoration plans. Note that the area applies to areas of bog not to areas of ARB.

Designation	Total area to be restored (ha)	Area (ha) where works completed to Nov 24	% of area where works completed to Nov 24
SAC	17,138	4,888	28.5
NHA proposed for retention	5,175	1,178	22.8
Total	**22,314**	**6,067**	**27.2**

3.4.1 MC02 Adapt/manage exploitation of energy resources (control of turf cutting and development of restoration plans)

This includes actions such as the designation of the site as an SAC or NHA, the subsequent development of site-specific restoration plans, and drainage management plans. It also includes NPWS compensation schemes, wider engagement by NPWS and preparatory actions (in advance of restoration works), such as refinement of original restoration plans, development of best practice restoration methodologies, stakeholder engagement and the signing of landowner agreements. All of these, as well as the growing environmental awareness of landowners, have led to a decrease in the extent of turf cutting, and an increase in readiness to implement restoration works. NPWS and the Department of Housing, Local Government and Heritage has committed significant resources to eliminating the impacts from turf cutting activity within designated sites, particularly SACs and NHAs within the current network that are proposed for retention. This includes the application of the Cessation of Turf Cutting Compensation Scheme (CTCCS) to the NHAs proposed for retention and the implementation of a turf cutting relocation programme. These measures have reduced turf-cutting trends within SACs and the NHAs that are proposed for retention. As of 2024, NPWS continue to negotiate with turbary right holders in an effort to cease cutting on designated raised bogs, with further reductions in the extent of turf cutting anticipated in 2025 (*e.g.* no cutting is expected to occur on Monivea Bog SAC, a site where an average of 45.7 plots were cut per year from 2019-2024).

Overall, across SACs, turf cutting has decreased by 35.5% (on a site basis) from an average of 25.3 SACs cut per year in the last reporting period (2013-2018) to 16.3 in the current reporting period (2019-2024). A similar decrease (of 38% on a site basis) was recorded among NHAs proposed for retention, with 21 of these sites cut in the 2013-18 period compared to 13 cut post-2018. The average number of plots cut per year across the SAC network decreased by 15.5% when comparing this reporting period (average of 264.2 plots cut/year from 2019-24) to the previous reporting

period (average of 312.8 cut/year from 2013-18). In 2024, the number of plots cut in SACs (Table 5) fell below 200 (to 185) for the first time and in 2025, it is anticipated that the number of plots cut in SACs will reduce significantly more. This marked downward trend in turf cutting activity is not visible in the NHAs proposed for designation or the NHAs proposed to be de-designated, nor is there clear evidence to suggest a downward trend across non-designated sites. However, one clear positive change across non-designated bogs is the decision of BnM to cease turf cutting with the company's last full peat harvest taking place in 2018, followed by a partial harvest in 2019 and a full suspension of harvesting operations in 2020. Further positive change is anticipated as a result of works undertaken by the Enhanced Decommissioning, Rehabilitation and Restoration Scheme (EDRRS), a large-scale project, running from 2021-26, aimed at rehabilitating and restoring previously harvested peatlands. Additional positive change is anticipated as a result of the recent work undertaken by the EPA in halting commercial peat harvesting operations.

The reduction or cessation of turf cutting has had a positive impact on all 46 bogs assessed (Table 8), although cutting continues to negatively impact on high bog habitats on approximately 16 of the 46 bogs. The positive impact has been assessed as high on 30 bogs, with turf cutting having ceased on all 30. The positive impact has been assessed as medium on 15 bogs. On one of these cutting has ceased, but the bog may be impacted by cutting adjacent to the bog. On the other 14, although cutting is ongoing, it is either very limited or occurring at significantly reduced levels than previously. On one site, the positive impact has been assessed as low. On this site although a restoration plan and drainage management plan have been developed, turf cutting levels have not reduced and are impacting ARB targets (see Appendix 17).

With a view to the management of the SACs and NHAs, site-specific restoration plans have been developed for all 62 raised bog SACs and the 36 NHAs proposed for retention. These detailed plans identify the drains that need to be blocked as well as any other measures such as bunding that may be needed for the site to achieve Favourable Conservation Status. The plans are currently being implemented by the NPWS with works undertaken on 31 designated sites (22 SACs and 9 NHAs) from 2019 to 2024 under the National Raised Bog Restoration Programme and the EU LIFE project The Living Bog. In total, by November 2024, 1,566 km of drains have been blocked with 525 km of these blocked during the reporting period.

Overall, based on the combination of activity trend, and efforts put in place to manage/reduce the exploitation of peat within SACs and NHAs proposed for retention, an increasing trend in the impact of this activity within these designated sites is expected in the next two reporting periods.

3.4.2 MC07 Habitat restoration/creation from resources, exploitation areas (drain blocking)

Actions proposed under the National Raised Bog Restoration Programme, including drain blocking, continue to be rolled out by the NPWS. Drains have been blocked in 20 of the 46 bogs assessed (Table 8) as part of the monitoring programme with the positive impact of drain blocking assessed as high on all 20 bogs (see Appendix 17). The drain blocking took place on 15 of the 20 sites during the reporting period. However, drain blocking in previous reporting periods is still having a positive impact on the extent and condition of ARB.

The restoration plans drawn up for each bog within a designated site, estimates the lengths of drains proposed to be blocked within each bog. Across the SAC network and NHA network that is proposed for retention, 43.3% of drains proposed to be blocked had been blocked by November 2024 with 33.5% of those drains were blocked within the reporting period (see Table 10). Within the SACs, 39.3% of drains proposed to be blocked had been blocked by November 2024 with 36% of those drains blocked within the reporting period. Within the NHAs proposed for retention, 51.1% of drains proposed to be blocked had been blocked by November 2024 with 29% of drains blocked within the reporting period. See Appendix 14 and 15 for details on a site-by-site basis. Drains were blocked within 22 of the 62 SACs and within nine of the 36 NHAs proposed for retention during the reporting period.

Table 10 Summary of lengths of drains blocked within SACs and NHAs proposed for retention during the reporting period, prior to the reporting period and overall and measured against the total length of drains proposed to be blocked in the restoration plans.

Designation	Total length of drains to be blocked (km)	Length of drains blocked pre-2019		Length of drains blocked 2019-24		Total drains blocked by November 2024	
		(km)	% of total to be blocked	(km)	% of total to be blocked	(km)	% of total to be blocked
SAC	2396.4	599.8	25.0	342.5	14.3	942.3	39.3
NHA proposed for retention	1220.6	441.4	36.2	182.7	15.0	624.1	51.1
Total	**3617.0**	**1041.2**	**28.8**	**525.1**	**14.5**	**1566.4**	**43.3**

The speed with which drain blocking is taking place has increased during this reporting period (see Table 10), with the increase from 28.8% of drains blocked at the start of the reporting period to 43.3% at the end of November 2024.

Outside of the designated network, information on drain blocking is less comprehensive. Fernandez & Eakin (in prep.) reported that drain blocking had taken place on 19 BnM bogs across 1,597 ha of high bog from 2009 to 2018. Recent information from BnM suggests this was an underestimate, or more likely didn't include restoration work that was undertaken towards the end of 2018 as Fernandez & Eakin (in prep.) listed a further 13 sites where restoration had been initiated but work had not been completed. Revised figures indicate that BnM blocked drains on 23 sites prior to 2019 across 2,323 ha of high bog. BnM have continued their restoration programme on deep-peat bogs with drains across an additional *c.* 2,000 ha of high bog blocked (mostly through PCAS/EDRRS) during the current reporting period (Appendix 20). Overall BnM have a target of undertaking restoration works on 8,100 ha of deep-peat bogs (https://www.bordnamona.ie/peatlands/peatland-restoration/). BnM are also undertaking rehabilitation works across their network of sites. Rehabilitation works focus on cutaway bogs where little or no peat remains. These systems cannot be restored in the short term but can be returned to a trajectory towards a naturally functioning peatland system through rehabilitation. BnM's target is to rehabilitate close to 80,000 ha of cutaway bog with 19,700 ha already rehabilitated (https://www.bordnamona.ie/peatlands/peatlands-rehabilitation/).

Other smaller scale projects have also undertaken restoration works during the reporting period, such as the Shanakyle Bog Restoration and Habitat Enhancement

Project, which was funded through the DAFM's locally led European Innovation Partnership (EIP) scheme under the Rural Development Programme. This project blocked drains with peat dams and installed bunds to raise the water table on an area of high bog and cutover located near Parteen in County Clare (O'Loughlin, 2022).

Overall, based on the combination of activity trend and the continued roll-out of the NPWS National Restoration Programme in implementing the actions recommended in the SSCOs within SACs and NHAs proposed for retention, an increasing trend in the impact from drain blocking within these designated sites is expected in the next two reporting periods.

3.4.3 MK03 Restoration of habitats impacted by multi-purpose hydrological changes (enhanced restoration measures)

Actions proposed under the NPWS National Raised Bog Restoration Programme include enhanced restoration measures such as trench bunding and contour bunding. Bunds have been constructed on eight of the 46 bogs assessed (Table 8) as part of the monitoring programme with the positive impact of the bund construction assessed as high on six bogs, and medium on two (see Appendix 17). Bund construction was undertaken on seven of the eight sites during the reporting period. However, bunds constructed in previous reporting periods continue to have a positive impact on the extent and condition of ARB.

The restoration plans drawn up for each bog within a designated site, estimates the length of bunds proposed to be built, as part of the restoration works to be undertaken within each bog. Across the SAC network and NHA proposed for retention network, 37.3% of bunds proposed to be built had been built by November 2024 with 98.5% of these bunds constructed within the reporting period (see Table 11). Within the SACs, 33.5% of bunds proposed to be built had been built by November 2024. Within the NHAs proposed for retention, 47.5% of bunds proposed to be built had been built by November 2024. See Appendix 21 and 22 for details on a site-by-site basis. During the reporting period, bunds were constructed in 14 of the 30 SACs (47%) and six of the 19 NHAs (32%) where they have been proposed. Note also that the success of bunds built on sites such as Cloncrow Bog NHA has led to a reappraisal of the methods, and further opportunities for bund construction other than what was initially proposed as part of the first phase of the restoration plans is being explored on a site-by-site basis as restoration works are undertaken.

Table 11 Summary of length of bunds built within SACs and NHAs proposed for retention during the reporting period, prior to the reporting period and overall, and measured against the total length of bunds proposed to be built in the restoration plans.

Designation	Total length of bunds to be built (km)	Length of bunds built pre-2019		Length of bunds built 2019-24		Total bunds built by November 2024	
		(km)	% of total to be built	(km)	% of total to be built	(km)	% of total to be built
SAC	215.7	1.6	0.7	70.7	32.7	72.3	33.5
NHAs proposed for retention	79.9	0	0	38.0	47.5	38.0	47.5
Total	295.6	1.6	0.5	108.7	36.8	110.3	37.3

The speed with which bund construction is taking place has increased during this reporting period (see Table 11), with the increase from 0.5% of bunds constructed at the start of the reporting period to 37.3% at the end of November 2024. Note that on a number of sites the works completed exceed what was originally proposed in the restoration plans (see Appendices 21 and 22). This reflects the iterative refinement of restoration plans during implementation. However, there are still 16 SACs and 13 NHAs proposed for retention where bunds have been proposed but not constructed to date. Note that since the opportunities and benefits of undertaking enhanced measures were not fully appreciated when the original SAC restoration plans were drawn up, NPWS reviews these plans prior to commencing site works, to identify any suitable areas where enhanced measures such as cell bunding may be undertaken.

Outside of the designated network and BnM sites, bund construction is likely to be rare, although it was undertaken by local groups on at least two sites. One of these is pNHA 000736 on which cell bunds were constructed using funding by the NPWS Peatlands Community Engagement Scheme. The other is Shanakyle Bog in County Clare where a series of high bog and cutover bunds were built in 2021 (O'Loughlin, 2022) with works funded through the DAFM's locally led European Innovation Partnership (EIP) scheme under the Rural Development Programme.

Overall, based on the combination of activity trend and the continued roll-out of the NPWS National Restoration Programme in implementing the actions recommended in the SSCOs within SACs and NHAs proposed for retention, an increasing trend in the impact from enhanced restoration measures within these designated sites is expected in the next two reporting periods.

3.4.4 MB14 Manage drainage and water abstraction for forestry (conifer plantation removal and restoration of drained areas)

Actions proposed under the NPWS National Raised Bog Restoration Programme include the targeted removal of specific conifer plantations, the blocking of associated drains and restoration of the associated peatland area. This has been implemented on seven of the 46 bogs assessed (Table 8) as part of the monitoring programme. The positive impact of these measures on ARB and DRB was assessed as high on two bogs, medium on four and low on one (see Appendix 17). These conservation works took place on two of the seven sites (Carrownagappul Bog SAC 001242 and Cloncrow Bog NHA 000677) during the reporting period. However, the conservation works undertaken in previous reporting periods continue to have a positive impact on the extent and condition of ARB. The works undertaken on Carrownagappul SAC 001242 in 2021 were of an innovative nature, with enhanced measures trialled here for the first time in Ireland, in an effort to combat the legacy of the ridge and furrow modification of the bog surface that otherwise remains. Much of the conifer plantations removed as part of Coillte's LIFE projects from 2004 to 2015 did not remove the ridge and furrows. As the ridges offer drier-loving non-bog plants (including conifer and birch) a niche to re-colonise, much of these areas will develop into birch woodland rather than open bog (assuming that the spread of non-native conifers is controlled). Enhanced measures are needed to combat the spread of drier-loving non-bog plants and thus the method of stump flipping (Cushnan *et al*., 2022) was trialled on a conifer plantation on Carrownagappul Bog SAC 001242 in 2021. In addition, cell bunding was constructed within former Coillte LIFE sites on Fisherstown Bog (Lough Forbes SAC 001818) in December 2023 and on Carn Park SAC 002336 in 2024. Stump-flipping is a process of carefully prying the root plate of a stump off the bog surface and turning it upside down in the adjacent furrow. Stump

flipping can be combined with other measures such as land reprofiling and contour/cell bunding to produce effective results and provide suitable hydrological conditions for peat-forming vegetation to develop.

In previous reporting periods, conifer removal and the blocking of associated drains was carried out by Coillte during two separate LIFE projects: LIFE04 NAT/IE/000121, which ran from 2004-08 and undertook works on 14 SACs and LIFE09 NAT/IE/000222, which ran from 2011-15 and undertook works on five SACs and 12 NHAs. The total extent of land within both projects was 1,256 ha: high bog (737 ha) and cutover (519 ha). An assessment of the second LIFE project results highlighted by Fernandez and Eakin (in prep.) indicated that 49 ha of ARB were expected to improve in quality and expand, as a result of the restoration works implemented. These gains are expected to occur not only within the project areas but also within high bog sections adjacent to them.

Outside of the designated network conifer removal and associated restoration works is likely to be very rare.

As discussed in section 3.3.4, the total amount of conifer plantations within SACs and the 36 NHAs proposed for retention amounts to 722 ha. The two Coillte LIFE projects removed 1,256 ha of conifer plantations from within SACs and NHAs proposed for retention from 2004-15. This equates to 63% of the plantations on these designated sites having already been removed. However, progress on this management measure greatly slowed with <2 ha of conifer plantation removed during the current reporting period. This is despite the fact that the SSCOs have identified 428.9 ha of conifer plantations within 22 SACs and 22 NHAs that need to be removed, for sites to achieve Favourable Conservation Status (Table 7 and Appendix 16). One of the reasons for the slow pace of progress on this Conservation Measure may be the legal complications involved in forest to bog projects; currently there is an obligation to replant an area within two years of a plantation being felled. Thus, the DAFM policy on forest to bog projects needs to be made clear, and a process to facilitate exemption from replanting needs to be established, for forest to bog projects on deep-peat sites. Peat soils in general have, however, been offered some protection from forestry through the Afforestation Scheme 2023-2027 (DAFM, 2024); where there is >30 cm of peat, only native forest types will be considered, and then only where no new drainage is needed.

Overall, based on the combination of activity trend and the continued roll-out of the NPWS National Restoration Programme in implementing the actions recommended in the SSCOs within SACs and NHAs proposed for retention, an increasing trend in the impact from conifer plantation removal and restoration of drained lands within these designated sites is expected in the next two reporting periods.

3.4.5 MI03 Management, control or eradication of other invasive alien species

Actions proposed under the NPWS National Raised Bog Restoration Programme include the control/eradication of non-native plants such as *Rhododendron ponticum* and *Sarracenia purpurea* as well as conifers such as *Pinus contorta* and *Picea sitchensis*, which may have spread onto high bog from adjacent conifer plantations. Control of such species has taken place during the reporting period on four of the 46 bogs assessed (Table 8), with the positive impact of these measures on ARB and DRB assessed as medium on one bog and low on three (see Appendix 17).

Control of invasives was also reported to have been undertaken by Coillte on a number of former LIFE sites during the reporting period, such as Drumalough Bog

SAC 002338, Cloonshanville Bog SAC 000614, Girley Bog SAC 002203 and Curraghlehanagh Bog SAC 002350. Outside of the designated network, control/removal of invasive species from ARB and/or DRB sites is likely to be relatively rare. However, one site where it did occur was Shanakyle Bog in County Clare which developed an Invasive Species Management Plan, implemented by the Shanakyle Bog Restoration Group, which carried out targeted eradication of *Rhododendron* and Sitka spruce saplings in 2021 and 2022 (O'Loughlin, 2022).

Overall, based on the combination of activity trend and the continued roll-out of the NPWS National Restoration Programme in implementing the actions recommended in the SSCOs within SACs and NHAs proposed for retention, an increasing trend in the impact from the control of non-native species within these designated sites is expected in the next two reporting periods.

3.4.6 MA13 Manage agricultural drainage and water abstraction (incl. the restoration of drained or hydrologically altered habitats)

Actions proposed under the NPWS National Raised Bog Restoration Programme include the targeted blocking or partial blocking of specific agricultural drains that the SSCOs have considered necessary to block, to achieve Favourable Conservation Status. Such restoration measures have taken place during the reporting period on two of the 46 bogs assessed (Table 8) with the positive impact of these measures on ARB and DRB assessed as low on both bogs (see Appendix 17). The two sites where this Conservation Measure was undertaken was through the FarmPEAT Project.

The FarmPEAT Project, was a locally-led, innovative, results-based farm scheme for farmers who manage lands that surround some of Ireland's finest remaining raised bogs and ran from 2021-24. The project operated across eight raised bog sites located in the Irish midland counties of Roscommon, Offaly, Kildare and Westmeath. The primary aims of the project were:

- to incentivise farmers to raise the water table in their peaty agricultural soils on the margin of the bog and in turn, lock away the stored carbon to help reduce Ireland's carbon emissions from agricultural sources
- to incentivise farmers to manage their land in the peat landscape more sensitively to reduce carbon emissions, support biodiversity and enhance and protect water quality
- to raise awareness, both within the farming community and the local communities, of the importance of this work, particularly the importance of keeping peat soils wet.

Drains were blocked on three bogs during the lifetime of FarmPEAT, two of which were part of the 46 bogs monitored for this report. However, FarmPEAT has now concluded, and a similar project is needed on a national scale to continue to encourage farmers to re-wet areas of agricultural land that border some of Ireland's most intact and important raised bogs.

In general, the Conservation Measures prescribed under this action are, so far, proving the most difficult to implement, with prolonged engagement required to progress the blocking of drains associated with agriculture.

The possibilities of more general Conservation Measures being undertaken to address the issue of agricultural drainage impacting on ARB may be possible through schemes such as ACRES (see section 3.4.7). Currently the lack of any specific

project/agricultural scheme aimed at raising water levels within agricultural lands adjacent to raised bogs is hindering progress in this conservation action. However, considering Ireland's Climate Action Plan (2024) has a target to reduce the management intensity (which includes raising the water table to within 10 cm of ground level) of at least 80,000 ha of drained, agriculturally managed, carbon-rich soils by 2030, a mechanism to implement this plan is likely imminent. The Tóchar restoration project is also expected to be a mechanism through which this Conservation Measure can be implemented, with a number of non-designated raised bog sites part of the first year of the scheme in 2025.

In terms of protecting the sites from additional drainage works, the undertaking of drainage works within a raised bog SAC is an Activity Requiring Consent (ARC). ARCs are specific activities, which have the potential to damage a Natura 2000 site. Thus, prior consent is required from the NPWS or another relevant public authority before such works are undertaken. This ensures an assessment of the ARC can be undertaken to determine if the activity can take place, and if any conditions should be attached to any consent given. It is an offence to carry out an ARC without prior consent.

Overall, based on the combination of activity trend and the continued roll-out of the NPWS National Restoration Programme in implementing the actions recommended in the SSCOs within SACs and NHAs proposed for retention, an increasing trend in the impact from this conservation measure within these designated sites is expected in the next two reporting periods.

3.4.7 MA14 Other measures related to agricultural practices

Although no site-specific Conservation Measures are reported under this heading, there are two general agricultural schemes that have been launched during the reporting period by DAFM that are likely to have benefits in regard to reducing ammonia deposition and/or increasing the water table adjacent to raised bog sites. These are the Low Emission Slurry Spreading (LESS) Scheme and the Agri-Climate Rural Environment Scheme (ACRES).

The LESS scheme launched in 2023 (DAFM, 2025) provides funding for farmers to purchase specialist LESS equipment. The use of such equipment reduces the loss of nitrogen gases into the atmosphere from the practice of spreading slurry.

The ACRES scheme (DAFM, 2022) has two measures that should reduce nitrogen deposition on raised bog habitats. The LESS measure within ACRES promotes the practice of low emission slurry spreading amongst participant farmers by issuing a payment to farmers for adopting the measure. ACRES also includes an optional results-based scorecard measure for Low Input Peat Grassland, available only to farmers with grasslands on peat soil, within 500 m of designated raised bogs. This should incentivise farmers to improve management of these grasslands. A potential outcome is the raising of water tables and the reduction of fertiliser inputs in grassland areas immediately surrounding raised bogs. However, in contrast to FarmPEAT, the capital costs involved in blocking drains *etc*. are not included in the scheme. The exception to this may occur on some western raised bog sites, where drain blocking may be funded through Landscape Actions under the ACRES Co-operation approach.

More general regulations under CAP23, such as the Good Agricultural and Environmental Condition (GAEC) 2, which relates to the protection of peatland and wetlands, once implemented will also provide some protection from drainage for peat soils across the country whether close to designated raised bogs or not.

The Irish Breeding Curlew EIP (Finney *et al*., 2024) although not directly related to the restoration and management of ARB itself, will have undertaken actions that contribute to the conservation of attributes of ARB such as the restoration of typical ARB fauna and the restoration of rare fauna. This project was active in a number of NHA raised bogs in south Leitrim during the reporting period. Management measures undertaken by the EIP included a results-based approach to management of Curlew breeding habitats and predator control for key threatened, ground nesting bird species, particularly Curlew.

4 Conservation status assessment

A summary of the national conservation status assessment and trend for ARB and DRB is given in Table 12 below. The detailed parameter-by-parameter analysis and justifications are presented in sections 4.1 (ARB) and 4.2 (DRB).

Table 12 The overall national conservation status assessment and trend for each parameter of both ARB and DRB habitat. UB = Unfavourable Bad; UI = Unfavourable Inadequate; F = Favourable.

Habitat	Range	Area	Structure and Functions	Future Prospects	Overall
ARB (7110)	UB – Stable	UB - Increasing	UB - Improving	Bad	UB - Improving
DRB (7120)	UB – Stable	UB - Increasing	UB - Improving	Bad	UB - Improving

4.1 Active Raised Bog conservation status assessment

4.1.1 Range

The habitat Current Range (CR) is 19,400 km^2 (194 10 km cells) (see Figure 1 and section 3.1.3 for further details).

The CR value is much smaller than the range of the raised bog resource in Ireland, as not all raised bogs contain ARB. Figure 1 shows that the CR is separated into two major units. The larger one stretches throughout the midlands and the smaller, elongated polygon within counties Clare and Kerry. The DRB CR map also illustrates a gap between these two main areas, which corresponds with areas not suitable for the development of raised bogs (Hammond, 1979). As highlighted by Fernandez and Eakin (in prep.) two isolated records of ARB are also reported in counties Louth and Wicklow in the east. These are remnants of a previous more extensive habitat distribution along the southern and eastern margins of the country, where raised bog development was confined to small basins. These small, raised bogs were drained and cutaway down to the mineral layer in historical times (NPWS, 2007).

FRR is 22,600 km^2 (226 10 km cells), and corresponds to the DRB CR plus the ARB CR.

The CR is 14.2% below the FRR. A CR value more than 10% below the FRR value is considered to be Unfavourable Bad according to the summary matrix given by DG Environment (2023a) (see Table 1).

Although the CR value (194 10 km grid cells) is larger than the one provided in 2019 (173 10 km grid cells), this is the result of better knowledge of the habitat distribution, and a recent recognition that ARB can occur on cutover, as described in section 3.1.3. Thus, no actual changes have taken place in the 2019-2024 reporting period. Range was deemed to have remained Stable in the last two reporting periods, as given by Fernandez and Eakin (in prep.) and Fernandez *et al*. (2014). Current habitat Range is therefore also given a Stable trend in the long-term (2001-2024) and short-term (2013-2024).

The overall Range national conservation status assessment for ARB is therefore Unfavourable Bad-Stable.

4.1.2 Area

The current extent of ARB is estimated to be 1,843 ha (Table 13) which is a 122 ha (7.1%) increase since 2018. A slight decrease was estimated to have occurred in the 2013-18 reporting period (Fernandez and Eakin, in prep.). A figure for the decrease was not estimated by Fernandez and Eakin (in prep.) but is believed to have been in the same region (*c.* 1-2%) as for the 2007-12 period calculated by Fernandez *et al*. (2014). Thus, over the short-term (two reporting periods), there has been an estimated increase of 5-6% in the extent of ARB, since 2013. However, because of the large losses of ARB reported in the late 1990s and early 2000s (NPWS, 2008), over the long-term (four reporting periods) there has been an estimated decrease of between 10-30% since 2001.

Approximately 65% of the national ARB is within the 55 SACs where ARB is a QI with another *c.* 7% in the two SACs proposed for designation. The 36 sites within the network of NHAs proposed for retention contain *c.* 12% of the national ARB, with the 25 NHAs proposed for designation containing *c*. 5% and the 46 sites proposed to be de-designated containing 4%.

Table 13 Change in the extent of ARB in Ireland over the reporting period (2019-2024).

Category of raised bog	ARB (ha)	
	2018[1]	2024
55[2] SAC sites with ARB as QI	1,180	1,195
5[3] SAC sites with ARB not QI	6	8
2 SACs proposed for designation	38	128
36 NHAs proposed for retention (including 7 partially)	218	226
25 NHAs proposed for designation (from NHA review, 2014)	88	101
46 NHAs proposed to be de-designated (including 7 partially) (from NHA review, 2014)	84	75
1 other 'restored' BnM site for which post-restoration data is available	5	13
91 non-designated sites	96	91
9[4] sites with ARB recorded on cutover	6	6
Total	**1,721**	**1,843**

[1] The estimated total extent of ARB present in 2018 has been revised from the figure of 1,663 ha given by Fernandez & Eakin (in prep.) for the 2019 Article 17 report. This revised estimate occurred on sites where either (1) new surveys were carried out (Appendix 5, 6 & 8) or (2) a re-assessment was made through aerial imagery analysis (Appendix 7). Revisions have been made in each of the above categories.

[2] Derragh Bog SAC (002201) was not included in this table by Fernandez & Eakin (in prep.). Ballygar (Aghrane) Bog SAC (002199) was included as well as the original 53 SACs.

[3] Three of the six sites included here by Fernandez & Eakin (in prep.) are now listed under different categories (pNHA 002138, which occurs within the River Shannon Callows SAC 000216 and pNHA 000953, which occurs within the Lough Oughter and Associated Loughs SAC 000007 are both categorised as proposed NHAs while Lough Tee Bog West, which occurs within the Lough Corrib SAC 000297 is categorised under NHAs proposed to be de-designated). Two additional sites (Girley (Drewstown) Bog SAC 002203 and Derrinlough (Cloonkeenleananode) Bog SAC 002197) are now included here as ARB has been reported from within them.

[4] This includes six sites within SACs and three non-designated sites. Figures only included in the ARB on cutover category and not included elsewhere. Note that although no increases in ARB was recorded on cutover post-restoration, increases in the extent of High *Sphagnum* habitats were recorded, which it is anticipated lead eventually to increases in ARB habitat on cutover.

As noted in Table 13, the extent of ARB present on a number of sites in 2018 was re-assessed during this project. This occurred on sites:

- Where new data from field surveys undertaken in 2019-24 indicated that the 2018 figures needed to be amended.
- Where a 20% loss in ARB was applied in 2018. This loss factor was applied in 2018 as a broad stroke across 21 NHAs where ARB was present, but no survey had been undertaken since before 2010. An analysis of aerial photography of each of these 21 sites was undertaken during this project and a loss (or not) factor of ARB was applied instead on a site-by-site basis. See Appendix 7c.
- Other sites not surveyed since before 2010. Ten SACs have not been surveyed since before 2010. An analysis of aerial photography of each of these 10 sites was undertaken during this project, and a loss (or not) factor of ARB was applied on a site-by-site basis. Losses were estimated to have occurred on eight of the sites. See Appendix 7a. An SAC where ARB is not a QI was also assessed in this way, as well as one NHA, which was last surveyed in 2010.

As indicated in section 2.1.1 (and Appendix 3) ecotope surveys were undertaken on 64 bogs during the reporting period, and a conservation condition assessment was undertaken on 46 of these. Twenty-nine of the 46 were within SACs (occurring across 21 SACs), 13 within NHAs proposed for retention and four within NHAs proposed for designation (occurring across two pNHAs). The conservation condition assessment of area on these bogs (see Appendix 23) is summarised below in Table 14:

Table 14 Summary of the conservation condition assessment for area of ARB on the 46 bogs assessed during the reporting period showing the number of bogs assessed under each category and the main reasons why. Area status classed against FRV as Favourable (F), Unfavourable Inadequate (UI) and Unfavourable Bad (UB). Area trend classed as increasing, stable or decreasing.

	F	UI	UB	Comment on trend
Increasing	0	2	16	Main reason for increasing trend on 16 of these bogs was the result of restoration works. The remaining two bogs are recovering from a fire event. Turf cutting took place on five of the bogs, but its impact was negated by restoration. However, decreases are likely in the future if turf cutting continues.
Stable	0	0	18	Restoration works have taken place on two of these bogs though no positive trend was recorded yet. Turf cutting took place on six of the bogs, and while no losses of ARB were reported, if cutting continues in the future, losses of ARB are expected.
Decreasing	0	0	10	Restoration works have taken place on two of the bogs. In one of these, the impacts of subsidence and past drainage continue to cause losses of ARB and in the other (where turf cutting had continued) the works were undertaken too soon (*c.* one month) before an ecotope survey, for a positive trend to be recorded. In all, turf cutting took place on five of these bogs. High bog drainage remains open on the other five, potential impacts of ammonia deposition were identified on two and a recent fire event on another.

As Table 14 above indicates, none of the 46 bogs have yet reached a Favourable status in terms of extent of ARB present. Two (Ferbane Bog SAC 000575 and Girley Bog NHA 001580) have reached Unfavourable Inadequate indicating that the area of ARB is 5-15% below the FRV and 44 remain Unfavourable Bad indicating the area of ARB is >15% below the FRV. However, the trend in the extent of ARB was assessed as increasing on 18 bogs (39%). This was attributed to restoration works on 16 bogs with the remaining two (Flughany Bog SAC 000497 and Cashel Bog NHA 001405) recovering from a past fire event. Trend was assessed as stable on 18 (39%) bogs. However, turf cutting was recorded on six of these and if this continues, future losses of ARB are expected. Finally, a decreasing trend was recorded on 10 (22%) of the bogs. This was mainly due to the impacts of continued turf cutting (on five sites) and subsidence associated with past cutting on another (Clara Bog SAC 000572). The impact of drainage was considered to be a contributing factor on the remaining four bogs, though a recent fire event was the main cause of the decrease on one of them (Kilcarren Bog part of SAC 000647). The impacts of ammonia deposition were also considered to be a potential contributing factor on two of these bogs (Firville Bog part of SAC 000647 and Mount Hevey Bog SAC 002342).

Ecotope surveys were conducted on 18 additional bogs across nine sites where no conservation condition assessment was undertaken. One of these was an SAC, five (across three sites) were within NHAs proposed for designation, five (across one site) were within an SAC proposed for designation and seven (across four sites) were non-designated sites. A baseline survey was available to compare against for the SAC, the SAC proposed for designation, two of the bogs within NHAs proposed for designation and one non-designated site. The extent of ARB within the SAC was

estimated to have remained stable while a large increase (of *c.* 94 ha) was recorded within the pSAC 002191 (BNM, 2025) where restoration works proved to be very successful. An increase in ARB in one of the bogs within an NHA proposed for designation was recorded, attributed to restoration works, while a decrease was recorded in the other, attributed to drainage. An increase of *c.* 8.4 ha was recorded on the non-designated site (listed in Table 13 as the other 'restored' BnM site). This is the only non-designated bog to show an increase in ARB within the reporting period. By contrast, one non-designated site (Tombrickane Bog) is likely to have lost all ARB within the reporting period due to the insertion of drains on the high bog.

Note that while Table 13 shows no change in the extent of ARB reported from the cutover, there has been increases in High *Sphagnum* habitat reported from sites where enhanced restoration works were undertaken on the cutover, such as Cloncrow Bog (Crowley *et al*, 2023) and Killyconny Bog (Crowley *et al*., 2021). It is anticipated that these increases in High *Sphagnum* habitat will eventually lead to increases in the extent of ARB on cutover over time. The success of the enhanced measures on these sites has led to a reappraisal of restoration methods, and opportunities to implement these measures on further sites are now considered, when developing site-specific restoration plans further.

The National Raised Bog SAC Management Plan (NPWS, 2017) assessed the national ARB Area FRV as being 3,600 ha, corresponding with the extent of ARB and DRB (based on the new habitat interpretation) within the current SAC and NHA network when the Habitats Directive came into force in 1994. The national ARB Area FRV was reviewed by Fernandez & Eakin (in prep.) and estimated to be 4,159 ha. This was calculated by adding up the extent of ARB and DRB within the entire country (*i.e.* including that within non-designated sites). The current habitat area (1,843 ha) is 55% below the FRV (4,159 ha). A habitat Area that is more than 15% below the FRV is Unfavourable Bad.

NPWS (2017) estimated that 3,747 ha of ARB can be achieved within the proposed new network of designated raised bogs (57 SACs and 61 NHAs) in the long term if restoration works are implemented in the short to medium term. This figure corresponds with 1,534 ha of ARB, 1,765 ha of DRB and 448 ha of cutover areas expected to become peat forming habitat, once restoration works are implemented, and is above the national ARB target of 3,600 ha within the network of designated sites. However, it does not take into account any ongoing losses due to damaging activities. The achievement of this target is considered necessary to restore the Favourable Conservation Status of ARB within the network of designated sites and, as a result, help meet the national target of 4,159 ha.

Although the current extent of ARB (1,843 ha) is far from achieving Favourable (3,951 ha), or even Unfavourable Inadequate status (3,535 ha), this is the first reporting period in which an overall increase in the extent of the habitat has been recorded. The review of major impacting activities affecting designated raised bogs in sections 3.3 and 3.4 helps explain how the increase in the extent of ARB during the reporting period has come about, as the assessment outlines that positive measures (restoration works) are currently outweighing any ongoing negatively impacting activities within designated sites. Ultimately, the increase in ARB is due to the large amount of restoration works having been undertaken during this and previous reporting periods.

A 7.1% increase in the extent of ARB has been estimated during the reporting period (from 2019-24). Over the short-term (two reporting periods or since *c.* 2013), there has been an estimated 5-6% increase, and over the long-term (four reporting periods or since *c*. 2001) there has been an estimated decrease of between 10-30%.

To summarise, the overall Area national conservation status assessment for ARB is Unfavourable Bad - Increasing.

4.1.3 Structure and Functions

As indicated in section 2.1.1, a conservation condition assessment was undertaken on 46 of bogs during the reporting period. The conservation condition assessment of S&F on these bogs (see Appendix 23) is summarised below in Table 15:

Table 15 Summary of the conservation condition assessment for Structure and Functions of ARB on the 46 bogs assessed during the reporting period showing the number of bogs assessed under each category and the main reasons why. S&F status classed against FRV as Favourable (F), Unfavourable Inadequate (UI) and Unfavourable Bad (UB). S&F trend classed as increasing, stable or decreasing.

	F	UI	UB	Comment on trend
Improving	0	1	11	Main reason for improving S&F trend on these 12 bogs was the result of restoration works.
Stable	0	2	11	Restoration works have taken place on three of these 13 bogs though no positive trend for S&F was yet recorded.
Declining	0	2	19	Restoration works have taken place on five of the bogs, and though an increase in high quality vegetation was recorded on two of these, an overall decline in S&F was estimated on them due to ongoing turf cutting. In all, turf cutting took place on 16 of these bogs. High bog drainage remains open on a further four bogs and this, combined with cutover drainage, the potential impacts of ammonia deposition, and a recent fire event on another bog, has led to a decline in S&F on 21 bogs in total.

The analysis of S&F during the reporting period was largely restricted to the 46 bogs for which a conservation condition was undertaken. As Table 15 above indicates, when S&F were assessed against the current extent of ARB, five bogs were assessed as Unfavourable Inadequate (Shankill West Bog SAC 000326, Lough Garr Bog NHA 001812, Derrinea Bog SAC 000604, Mongan Bog SAC 000580, and Corliskea Bog (part of SAC 002110)) in terms of S&F. All are assessed as Unfavourable Bad when the S&F is compared against the long-term FRV.

The trend in the S&F of ARB was assessed as improving on twelve of the bogs (26%), and this was attributed to restoration works on all eleven of these bogs. Trend was assessed as stable on 13 (28%) bogs. Restoration work was undertaken on three of these but a positive trend in S&F has not yet been recorded. Finally, a declining trend was recorded on 21 (46%) of the bogs. This was mainly due to turf cutting having taken place in the reporting period (on 16 bogs). A recent fire event was the main cause of the decline on another bog (Kilcarren Bog SAC 000647). Drainage was likely the main cause of the decline on the other four sites with the potential impacts of ammonia deposition considered to be a contributing factor on two of the four bogs (Firville Bog part of SAC 000647 and Mount Hevey Bog SAC 002342). Restoration works have taken place on five of these 16 bogs, and though

an increase in high-quality vegetation was recorded on two of these, an overall decline in S&F was estimated due to ongoing turf cutting.

The National and site-specific ARB S&F target is for 50% of the habitat area to correspond with the highest vegetation quality types (*i.e*. active flush/soak, Bog woodland and central ecotopes). The long-term national ARB Area FRV is 4,159 ha (see section 4.1.2) and thus the habitat S&F national target is for 2,079.5 ha of ARB to correspond with the best quality vegetation. The current extent of active flush/soaks and central vegetation types within the sites for which ecotope surveys have been undertaken so far is 428 ha (a very small amount of the best quality vegetation types are likely to be found within non-designated sites). As this figure is more than 25% below the FRV (2,079.5 ha), the S&F are given an Unfavourable Bad assessment. A similar assessment was given in 2018 (Fernandez & Eakin, in prep.). The overall estimate of 428 ha of good-quality vegetation occurring nationally is a revised estimate of the 417 ha estimated in 2018 (NPWS, 2019). The change is accounted for by the slight net increase (1 ha) in high-quality ecotopes in the 46 bogs for which a conservation condition was undertaken as well as the *c*. 10 ha of newly recorded areas (not necessarily newly established) of high-quality ecotopes in the 18 other ecotope surveys carried out during the reporting period. An unquantified decline in the S&F of ARB was reported in 2018 (NPWS, 2019) for the 2013-18 reporting period. This decline is estimated to be in the same order as the increase reported from 2019-24. Thus, over the short-term, the extent of high-quality vegetation types is estimated to have remained stable. However, the quality of the sub-central ecotope was noted as improving on the sites where restoration works were undertaken and thus, overall, the S&F are estimated to have improved in the short-term. The smaller improvements in the S&F of ARB compared to the increase in the extent of ARB indicates that achieving the best quality ecotopes takes a longer time after restoration works than merely achieving ARB. Over the short-term (two reporting periods or since *c.* 2013), a slight improvement in S&F is estimated, while over the long-term (four reporting periods or since *c*. 2001) there has been a decline.

To summarise, the overall S&F national conservation status assessment for ARB is Unfavourable Bad - Improving.

No specific typical species conservation status assessments have been undertaken at site or national level. A change in the habitat Quality (S&F) implies a change in the occurrence of typical species and therefore they are deemed interdependent. As a result, a similar assessment to the S&F (UB-Improving) is given to typical species.

4.1.3.1 Extent of ARB in good condition

The extent of ARB in good condition is assessed by estimating the extent of ARB on bogs where good quality vegetation covers more than 50% of the ARB on the bog. This goes back to the target at a site level “to maintain/restore sufficient high-quality bog vegetation (*i.e*. central ecotope and/or flushes/soaks). At least 50% of ARB habitat should be central ecotope and/or flush/soaks.”

On the basis of this 50% threshold, ARB is considered to be in good condition at only one SAC, Carrowbehy/Caher Bog SAC (000597) where 72.8 ha is present. Thus, within the Natura 2000 network, where ARB is a QI, the habitat is in good condition in 0.73 km^2 (6.1% of the network). The condition is Unknown in 1.55 km^2 (13.0%) where ecotope surveys have not been undertaken since before 2010 and in the remaining 9.67 km^2 (80.9%), the ARB is not in good condition.

In the last reporting period, Fernandez and Eakin (in prep.) reported the ARB within three SACs to be in good condition; Carrowbehy/Caher Bog SAC (000597), Ballynamona Bog and Corkip Lough SAC (002339) and Mongan Bog (SAC 000580).

The most recent survey of Mongan Bog estimated that high-quality vegetation accounted for only 43% of the ARB so the ARB on Mongan is no longer considered to be in good condition. However, a reassessment of the previous data for Mongan estimates that high-quality vegetation did not account for 50% of the ARB at that time either, and thus it is not a real change. The data for Ballynamona Bog and Corkip Lough SAC is 25 years old and the condition of ARB on this site is now considered Unknown.

Nationally, ecotope surveys undertaken since 2010 across 2.22km^2 of ARB in NHAs proposed for retention, 1.28km^2 of ARB in sites that are proposed for designation as an SAC and 0.32km^2 of ARB in sites that are proposed for designation as an NHA revealed that the ARB within these bogs was assessed as not in good condition. Recent ecotope surveys of non-designated sites have also revealed the 0.33 km^2 of ARB to be in not good condition using the criterion above. Thus nationally, it is estimated that 0.73km^2 (4%) of ARB is in good condition, 13.83km^2 (75%) of ARB is not in good condition, and the condition is Unknown in 3.87km^2 (21%) of ARB.

Overall, extent of the surface area in good condition within SACs (and nationally) is assessed as being stable in the short-term.

4.1.4 Future Prospects

Future Prospects indicate the direction of expected change in conservation status in the near future (two reporting periods/12 years) based on a consideration of the current status, reported pressures and threats, and measures being taken for each of the three parameters (Range, Area, and S&F).

As indicated in section 2.1.1 a conservation condition assessment was undertaken on 46 bogs during the reporting period. The conservation condition assessment of Future Prospects on these bogs (see Appendix 24) is summarised below in Table 16.

Table 16 Summary of the conservation condition assessment for Future Prospects (FP) of ARB on the 46 bogs assessed during the reporting period showing the number of bogs assessed under each category and the main reasons why. FPs are assessed against the two parameters (Area and S&F) as either Good, Poor or Bad.

	Good	Poor	Bad	Comment on trend
Area	7	11	28	Substantial restoration works have been undertaken on all seven of the bogs where the FP are considered good. No major impacts/threats were recorded on these bogs. Substantial restoration works have also been undertaken on the 11 bogs where FP are considered poor. However, significant impacts/threat were also recorded on some of these bogs. Turf cutting is ongoing on 12 of the 28 bogs where the FP is bad. Restoration works have only been undertaken on three of these 28 bogs, and in each of these cases, significant pressures are predicted to override the restoration undertaken in the next 12 years.
S&F	1	15	30	The restoration works on one site have resulted in a good assessment of FP. Substantial restoration works have also been undertaken on another 15 sites resulting in a poor assessment of FP. These are considered poor (as opposed to good) due to the current conservation assessment of these sites S&F being bad as well as the fact that achieving higher quality ARB is expected to take longer than merely achieving ARB and/or significant impacts/threat were also recorded and/or further restoration measures are needed to achieve Favourable Conservation Status. Turf cutting was recorded as ongoing on 16 of the 30 sites with a FP of bad.

As Table 16 above (and Appendix 24) indicates, only one (Garriskil Bog SAC 000679) of the 46 bogs (2%) is assessed as having good overall FP. This site is expected to achieve a Favourable conservation condition within the next two reporting periods. Five bogs (11%) (Carrownagappul Bog SAC 001242, Ferbane Bog SAC 000575, Moyclare Bog SAC 000581, Shankill West Bog SAC 000326 and Aughrim Bog NHA 001227) are expected to achieve an Unfavourable – Inadequate conservation condition and 40 (87%) are expected to remain in an Unfavourable Bad conservation condition.

These results represent a limited number of sites, most of which are designated. The 46 bogs assessed support 732 ha of ARB, equivalent to 39.7% of the national resource of 1,843 ha. As Fernandez and Eakin (in prep.) note, a holistic national assessment of ARB FPs should consider the effects of negative (Section 3.3) and positive activities (Section 3.4) during the reporting period, their reported trends and how these may change over the next two reporting periods. It should also consider the current implementation of Conservation Measures and their likely benefits for the habitat over the next 12 years. Of the nine main pressures and threats, five (turf cutting, drainage, burning, forestry and problematic native species) are expected to decline in influence as Conservation Measures are implemented. Two (invasive species and ammonia deposition) are expected to remain stable, while two (drainage for agriculture and climate change) have an increasing threat. However, there is potential to reverse the trend in relation to drainage for agriculture in the next reporting period considering that one of the targets of the Climate Action Plan 2024 is

to reduce the management intensity of at least 80,000 ha of drained, agriculturally managed, carbon-rich soils by 2030. This target includes raising the water table to within 10 cm of ground level. If this target is met, it is likely that drainage for agriculture will have a decreasing threat in the next reporting period. Additionally, the Nature Restoration Law requires EU Member States to prepare national restoration plans by 2026 and restore at least 30% of habitats in poor condition by 2030, 60% by 2040 and 90% by 2050. Meeting these targets would likewise be expected to reduce the threat of agricultural drainage to ARB. The impact of all seven listed Conservation Measures is expected to increase. However, the assessment may differ for non-designated sites, particularly those outside the BnM network.

Although a decreasing trend in negatively impacting activities and an increasing trend in positively impacting ones can be expected in the future, the conservation status of the area and S&F of the habitat is expected to remain Unfavourable Bad, in the next two reporting periods. This is because the extent of ARB is expected to remain >15% below the FRV and the S&F is expected to remain >25% below the FRV. This is due to the continuation of pressures and threats within and outside of the designated sites and practical challenges in implementing the national restoration ambition. Nevertheless, if these issues are addressed, Future Prospects can be dramatically improved as works continue to be undertaken as part of the National Raised Bog Restoration Programme.

4.1.4.1 FP of Range

The Future Prospects for range is reported as being bad. The range is expected to remain stable but below FRV over the next two reporting periods. It is acknowledged also that the habitat is under threat in non-designated sites, some of which are the only example of the habitat within a 10 km square. For example, ARB within at least three 10 km grid squares (N05, N21 and N53) is in danger of being lost in the next two reporting periods, if turf cutting continues at current levels. Such losses are likely to impact negatively on the habitats range.

4.1.4.2 FP of Area

The Future Prospects for Area is reported as being poor. The extent of ARB is expected to increase over the next 12 years but the area is expected to remain >15 % below the FRV. However, if all of the measures outlined in section 6 below are implemented, the predicted future trend can be expected to move from positive to very positive (*i.e*. an increase of >1%/ year or >12% increase in the area of ARB in 12 years), at which point the resulting Future Prospects for Area can be expected to be good.

4.1.4.3 FP of Structure and Functions

The Future Prospects for S&F is reported as being poor. The quality of ARB is expected to increase over the next 12 years but the S&F is expected to remain >25 % below the FRV. However, if all of the measures outlined in section 6 below are implemented, the predicted future trend can be expected to move from positive to very positive, at which point the resulting Future Prospects for S&F can be expected to be good.

4.1.4.4 Overall FP

The overall Future Prospects are bad because the FP of Range is bad. Although a decreasing trend in negatively impacting activities and an increasing trend in

positively impacting ones can be expected in the future, the conservation status of the extent and S&F of the habitat is expected to remain Unfavourable Bad in the next two reporting periods. This is because the extent of ARB is expected to remain >15% below the FRV and the S&F is expected to remain >25% below the FRV. The increases in extent and S&F of the habitat are expected to continue throughout the next two reporting periods, but the degree of this increase will depend on and is subject to ongoing management and restoration programmes being continued and/or initiated as outlined in section 6 below.

4.1.5 Overall Conservation Status Assessment

A conservation condition assessment was undertaken on 46 bogs during the reporting period (see section 2.1.1). The overall conservation condition assessment on these bogs (see Appendix 23) is summarised below in Table 17.

Table 17 Summary of the overall conservation condition assessment of ARB on the 46 bogs assessed during the reporting period, showing the number of bogs assessed under each category and the main reasons why. Overall conservation condition assessed as either Favourable (F), Unfavourable Inadequate (UI) and Unfavourable Bad (UB). FP trend classed as increasing, stable or decreasing.

	F	UI	UB	Comment on overall condition
Increasing	0	0	12	Substantial restoration works have been undertaken on all 12 of these sites. The assessment surveys were generally undertaken within two years of the works, which is unlikely to have been sufficient time for the impacts of the works to move the status of the ARB on site from Unfavourable Bad to Unfavourable Inadequate or Favourable.
Stable	0	0	12	Restoration works have taken place on three of these sites and turf cutting has ceased on all 12. The works on one of the sites possibly occurred too soon before the assessment survey to pick up an improving trend. On all 12 sites further restoration works are needed.
Decreasing	0	0	22	Turf cutting is ongoing on 16 of these bogs. Restoration works have been undertaken on six, but four of them continue to be cut for turf, a fifth has ongoing subsidence issues associated with past turf cutting while the sixth is also likely to be still suffering from past damage. On all 22 sites further restoration works are needed.

As Table 17 indicates no site has achieved an overall Favourable conservation condition assessment or Unfavourable Inadequate assessment with 46 (100%) considered Unfavourable Bad. An improving overall trend was recorded on 12 bogs (26%), stable on 12 (26%) and declining on 22 (48%). The above individual site conservation condition assessment results represent the condition of the habitat within a relatively limited number of sites. A balanced overall habitat assessment should consider not only individual condition assessment within the reporting period but also trends within the reporting period and the next two reporting periods on the main impacting activities (both negative and positive).

Considering all of the above, each individual attribute is given the following assessment: Range (UB-Stable), Area (UB-Increasing), S&F (UB-Improving) and FPs (Bad). ARB is thus given an overall Unfavourable Bad-Improving assessment.

4.1.6 NATURA 2000 coverage and condition

4.1.6.1 Extent of ARB within SACs

Habitat area (ARB) within the Natura 2000 network is estimated at 12.03 km^2 (1,203 ha). This figure, which represents 65% of the entire national extent (18.43 km^2), corresponds with the extent of the habitat (1,195 ha) within the 55 SACs for which the habitat is QI and an additional 8 ha within five SACs for which the habitat is not a QI. This figure is mainly derived from on-the-ground ecotope surveys.

This figure is larger than the 1,186 ha estimated to have been present in these sites in 2018 and equates to an overall 17 ha increase (15 ha in SACs where ARB is a QI and 2 ha where it is not a QI). The main reason for this increase is because of the impacts of restoration works. However, although an overall increase in the extent of ARB has been estimated across the network, losses of ARB are still occurring within the network with losses of ARB estimated in 14 of the 55 SACs where ARB is a QI during the reporting period. Nevertheless, an overall Increasing Area trend for ARB is reported within the Natura 2000 network for the current reporting period (2019-2024). An overall national Area Increasing trend has also been estimated for ARB in the current reporting period (see section 4.1.2). Pressures (*i.e*. peat cutting, drainage; see section 3.3) continue to negatively impact ARB within the SAC network, despite the implementation of Conservation Measures at some sites (see section 3.4). During the short-term (2013-24), the extent of ARB within the Natura 2000 network in Ireland is estimated to have remained relatively stable. There is some uncertainty with this though as the exact losses in the extent of ARB from SACs in the period 2013-18 were not calculated. However, they are estimated to have been in the same region as the increases in extent of ARB in SACs from 2019-24. Thus overall, in the short-term (two reporting periods), the extent of ARB in SACs in Ireland is believed to have remained stable (although it decreased and then increased in the intervening years) and is currently increasing. The lack of a significant increase in the short term in the extent of ARB within the SAC network contrasts with the relatively large increase (90 ha) recorded in the two SACs proposed for designation over the same timeframe. The restoration works undertaken on these two sites was particularly successful, due to the baseline status of these sites (*i.e*. bogs had an extensive drainage network which could be blocked to raise the water table). Nonetheless, the extensive restoration works undertaken within the SAC network during the reporting period are anticipated to result in significant increases in the extent of ARB within the network by the time of the next reporting period.

Due to the large losses of ARB reported in the late 1990s and early 2000s (NPWS, 2008), over the long-term (four reporting periods) there has been an estimated decrease in the SAC network of between 10-30% since 2001.

4.1.6.2 Surface area in good condition in SACs

As discussed in section 3.1.1.1, ecotope surveys were undertaken on 29 bogs across 21 different SACs (where ARB is a QI) during the reporting period with 665.5 ha of ARB recorded. Another SAC (Lough Corrib SAC 000297) was partially surveyed with 3.0 ha of ARB recorded.

In the 2013-18 reporting period, ecotope surveys were conducted in four SACs (amounting to 81.1 ha of ARB) that have not since been surveyed. A further 291.2 ha of ARB was recorded on 20 bogs across 19 SACs in the period 2011-13 (that have not since been surveyed) by Fernandez *et al*. (2014). This amounts to 1,041 ha of ARB across those 45 SACs where an ecotope survey has been undertaken since

2010. Bogs in the other ten SACs (containing an estimated 154 ha of ARB) have not been surveyed since prior to 2010 and thus the condition of the ARB within these SACs is assessed as being Unknown.

Site-specific conservation objectives along with restoration plans have been developed by NPWS for the 55 SACs where ARB is a QI. Under these objectives, ARB is assessed as being in good condition when at least 50% of ARB habitat is composed of high-quality bog vegetation which is considered to be central ecotope and/or active flushes/bog woodland.

Using this criterion, ARB is in good condition in only one SAC within the SAC network: Carrowbehy/Caher Bog SAC (000597) where 72.8 ha is present. Thus, within the Natura 2000 network, ARB is in good condition in 0.73 km^2 (6.1% of the network), is not in good condition in 9.67 km^2 (80.9%), and the condition is Unknown in 1.55 km^2 (13.0%).

The extent of the surface area in good condition within SACs (and nationally) is assessed as being stable in the short-term.

4.1.6.3 Structure and Functions of ARB in SACs

29 of the 46 bogs assessed for S&F during the reporting period were within SACs where ARB is a QI. Overall, the quality of ARB within these sites has remained relatively stable over the reporting period with *c*.150 ha of the higher quality ecotope recorded. Increases in the extent of the higher quality ecotopes were recorded on eight bogs and decreases on seven.

Thus, an overall Stable S&F trend for ARB is reported within the Natura 2000 network for the current reporting period (2019-2024) and in the short-term (2013-2024) while a Declining trend is given to the S&F of ARB within the Natura 2000 network in the long-term but the actual extent of this decline is unknown.

4.2 Degraded Raised Bog conservation status assessment

4.2.1 Range

DRB Current Range (CR) is 22,200 km^2 (222 10 km grid cells) (see section 3.2.2). As per for ARB, DRB Range is dominantly in the midland counties with a narrower elongated area in the south-west of the country. Isolated records of DRB are present in counties Carlow, Cork, Louth and Wicklow.

DRB FRR is 0.0 km^2 (0 10 km grid cells) as the objective is to restore all DRB in the country. The CR value is more than 10% above the FRR value and therefore DRB Range has been given an Unfavourable Bad status.

Although the CR value is slightly larger than the one provided in 2019 (217 10 km grid cells), this is the result of improved knowledge of DRB distribution. Thus, no actual changes have taken place in the 2019-2024 reporting period. Range was also assessed as having remained stable in the last two reporting periods, as given by Fernandez and Eakin (in prep.), and Fernandez *et al.* (2014). As a result, habitat Range is also given a Stable trend for the long-term (2001-2024) and short-term (2013-2024). Therefore, the overall DRB national Range conservation status assessment is Unfavourable Bad–Stable.

4.2.2 Area

Fernandez and Eakin (in prep.) used a new definition of DRB (based on an eco-hydrological model) to estimate that the 2018 national extent of DRB (including DRB

within the SAC and NHA network as well as non-designated sites) to be approximately 2,500 ha (minimum value)**.** They also indicated that the extent of DRB within the proposed new network of sites is 1,765 ha. NPWS (2017) stated that all DRB within the proposed new network of designated sites (1,765 ha) has to be converted to ARB in order for both ARB and DRB to achieve Favourable Conservation Status within the network.

An accurate assessment of changes in DRB extent within the current reporting would require a comparison of modelled data from two widely separated dates, within the reporting period, for a representative selection of sites. No eco-hydrological modelling was undertaken during the current reporting period so a revised estimate of DRB cannot be undertaken. However, as the conservation status of DRB is intimately linked with that of ARB, the overall Area national conservation status assessment for DRB is Unfavourable Bad.

The trend is assessed by estimating the losses and gains that have occurred in extent of the habitat. Losses of DRB could occur for two main reasons:

1. Increases in ARB (from DRB), which is a positive trend.
2. Losses of DRB due to losses of supporting habitat to turf cutting, which is a negative trend.

Both scenarios are likely to have occurred during the reporting period so a decreasing trend in the extent of DRB is estimated in the reporting period. Whether that trend is due mainly to positive or negative factors is unknown, but considering that a 7% increase in ARB is reported, the likelihood is that most of the losses reflect a positive trend. Note that small increases in DRB may have occurred on some site where there were losses in ARB (a negative trend). Considering that the 2,500 ha estimate of DRB given in 2018 was a minimum estimate, and that the losses of DRB since then are believed to have been small (*e.g*. maximum loss of DRB to ARB estimated to be in the region of 130 ha), the overall minimum national extent of DRB is still estimated to be approximately 2,500 ha. Even smaller (unquantified) net losses of DRB were also reported by Fernandez and Eakin (in prep.) for the 2013-18 reporting period.

In the short-term, an unquantified positive trend in the extent of DRB is estimated. NPWS (2017) estimated an increase of 3.29 km^2 of DRB from 1994 to 2012/13. This was a negative trend as it largely came about because of decreases in the extent of ARB. The long-term trend in the extent of DRB is unknown, but likely negative.

The overall DRB Area national conservation status assessment is therefore Unfavourable Bad-Increasing.

4.2.3 Structure and Functions

The condition of DRB is very often related to the condition of ARB. SSCOs developed by NPWS for all raised bog SACs (https://www.npws.ie/protected-sites) recognise this interdependency between the three main raised bog habitats (7110, 7120 and 7150): “Based on the close ecological relationship between these three habitat types, it is not necessary to set conservation objectives for all three habitats individually. It is considered that, should Favourable conservation condition for ARB be achieved, then Favourable conservation condition for the other two habitats will also be achieved” (NPWS, 2017). Based on the above, and due to the absence of modelled DRB figures within two separate dates in the reporting period, the DRB S&F assessment has been based directly on the results of the ARB (S&F) assessment.

Thus, the S&F assessment of DRB is the same as for ARB, which is Unfavourable Bad - improving, both for the reporting period and the short-term. However, a decreasing trend is reported for the long-term.

NPWS (2019) based this condition assessment on the actual definition of the habitat (*i.e*. capable of being restored to ARB). Thus, it was assumed that DRB S&F are not in good condition at any of the sites, as the main objective is to restore the habitat to ARB. Therefore, all 25 km² of estimated DRB Area are deemed to be not in good condition.

4.2.4 Future Prospects

As the conservation status of DRB is intimately linked with that of ARB, DRB Future Prospects are also likely to significantly change in the following reporting period, provided significant progress is made in the next 12 years in the implementation of Conservation Measures proposed in the SAC Management Plan and outlined in section 6 below.

4.2.4.1 FP of Range

The Future Prospects for Range is reported as being bad as the habitat is under threat in non-designated sites, some of which are the only example of the habitat within a 10 km square. For example, DRB within at least four 10 km grid squares (G91, M99, N32 and N74) is in danger of being lost in the next two reporting periods if turf cutting continues at current levels. Such losses are likely to impact negatively on the habitats range.

4.2.4.2 FP of Area

The FRV for DRB is 0 ha, reflecting the national objective of restoring all DRB to ARB. DRB extent is expected to decrease over the next two reporting periods, as a result of ongoing restoration to ARB, which is reported as a positive trend. However, given the current national resource of *c*. 2,500 ha and the rate at which DRB is expected to convert to ARB, the habitat will remain substantially above the FRV (0 ha) throughout the next two reporting periods. For this reason, the FP of Area is assessed as Poor rather than Good, notwithstanding the positive direction of travel.

4.2.4.3 FP of Structure and Functions

The Future Prospects for S&F is reported as being poor. The quality of DRB is expected to improve over the next 12 years but the S&F is expected to not expected to attain the FRV.

4.2.4.4 Overall FP

The overall Future Prospects are bad because the FP of Range is bad. Although a decreasing trend in negatively impacting activities and an increasing trend in positively impacting ones can be expected in the future, the conservation status of the extent and S&F of the habitat is expected to remain Unfavourable Bad in the next two reporting periods. This is because the extent of DRB is expected to remain >15% above the FRV and the S&F is expected to remain >25% below the FRV. The decreases in extent (positive change as it is as a result of increases in ARB) and increases in S&F of the habitat are expected to continue throughout the next two reporting periods. The degree of this increase will depend on, and is subject to, ongoing management, and restoration programmes being continued and/or initiated as outlined in section 6 below.

4.2.5 Overall conservation status assessment

As the conservation status of DRB is intimately linked with that of ARB, each individual attribute of DRB is given the following assessment: Range (UB-Stable), Area (UB-Increasing), S&F (UB-Increasing) and FPs (UB-Increasing). DRB is thus given an overall Unfavourable Bad- Improving assessment.

4.2.6 NATURA 2000 coverage and condition

4.2.6.1 Extent of DRB within SACs

DRB estimates are derived from eco-hydrological modelling. As no eco-hydrological modelling was undertaken during the reporting period, estimates are reliant on previous work reported on by Fernandez and Eakin (in prep.).

Fernandez and Eakin (in prep.) estimated the habitat area of DRB within the Natura 2000 network at 12.18 km^2 (1,218 ha) with 1,173 ha within the 62 raised bog SACs and an additional 45 ha within SACs for which DRB is not QI. According to Fernandez & Eakin (in prep.) this figure represents 48.7% of the entire national extent (25 km^2) of the habitat. It is assumed that there have been losses and gains of DRB during the reporting period. The losses can be either positive (where the DRB has been restored to ARB) or negative (where DRB has been lost due to impacting activities such as turf cutting). The gains are generally negative (as they generally occur due to losses in ARB). As no eco-hydrological modelling work was undertaken during the reporting period, an accurate estimate of the current extent of DRB within the SAC network cannot be assessed. However, as there has been a slight increase in the extent of ARB since the last reporting period, a slight decrease in the extent of DRB is also likely. As a result, an Increasing trend (to reflect the positive trend of the decrease) is given to DRB within the Natura 2000 network in the 2019-2024 period. The actual extent of this change in extent is unknown. Thus, the current extent of DRB within the Natura 2000 network is estimated to be in the region of 12.0 km^2 to 12.2 km^2, which is a slight update on the figure of 12.2 km^2 estimated by NPWS (2019). During the short-term (2013-24), the extent of DRB within the Natura 2000 network in Ireland is estimated (with some degree of uncertainty) to have remained relatively stable. NPWS (2017) estimated an increase of 3.29 km^2 of DRB from 1994 to 2012/13. Thus, the long-term trend in the extent of DRB is unknown, but likely to be decreasing.

4.2.6.2 Surface area in good condition in SACs

SSCOs, along with restoration plans have been developed by NPWS for the 62 raised bog SACs. It is considered that should Favourable conservation condition for ARB be achieved on a site, then, as a consequence, Favourable conservation condition for DRB would also be achieved.

Fernandez and Eakin (in prep.) highlighted that under the actual definition of DRB habitat (*i.e.* capable of being restored to ARB), it is assumed that DRB is not in good condition at any of the sites, as the main objective is to restore the habitat to ARB. Therefore, all 12 km^2 of the DRB within the Natura 2000 network is deemed to be in not good condition. It is also given the same stable short-term trend as for ARB.

4.2.6.3 Structure and Functions of DRB in SACs

As the conservation status of DRB is intimately linked with that of ARB, an overall stable S&F trend for DRB is reported within the Natura 2000 network for the current reporting period (2019-2024) and in the short-term (2013-2024). A Declining trend is

given to the S&F of DRB within the Natura 2000 network in the long-term but the actual extent of this decline is unknown.

5 Discussion

The increase in the extent of ARB recorded during the current reporting period, the first increase of its kind, is the result of decades of planning and negotiation between the NPWS, NGOs, turbary right owners, landowners and other stakeholders. Good progress is being made on the implementation of the hydrological works identified as being necessary to achieve Favourable conservation condition in the restoration plans of the 62 SACs designated for ARB and/or DRB and the 36 NHAs proposed for retention with 27.2% of the works within these areas completed by November 2024. Significant progress has also been made in the reduction of the intensities of the two main pressures impacting on ARB namely drainage and turf cutting (see section 3.3.1.1).

ARB is coming under increasing pressure from ammonia emissions, climate change and agricultural drainage with further analysis of these threats needed. Over 90% of Ireland's raised bog SACs have been modelled as being above Critical Levels for atmospheric ammonia with agriculture identified as being the main likely source. Measures to combat these emissions need to be implemented, particularly adjacent to raised bogs. Agricultural drainage works on the margins of raised bogs were highlighted by Fernandez and Eakin (in prep.) as being a growing threat in the 2013-18 reporting period. The development of drainage management plans may help combat this issue, but the experience of EU LIFE, *The Living Bog* project indicates that attaining landowner permission to block these drains can be difficult. The *FarmPeat* project had some successes in blocking drains on agricultural land close to raised bogs and a similar project (at a wider scale and over a longer time period) may be necessary to incentivise landowners to raise the water table in their peaty agricultural soils on the margins of raised bogs.

Restoration plans have been developed for SACs and NHAs proposed for retention, and significant progress is being made on the implementation of the works identified in these plans as being necessary to achieve Favourable conservation condition on each site. By November 2024, restoration works had been completed on 28.5% of the areas within the 62 SACs designated for ARB and/or DRB and on 22.8% of the areas within the 36 NHAs proposed for retention. Works undertaken during the reporting period included blocking 525 km of drains and the construction of 109 km of bunds.

The extent of ARB is expected to keep increasing over the next two reporting periods as Conservation Measures already undertaken continue to impact the habitat and further measures are implemented. However, FRV's are unlikely to be achieved due to the continuation of pressures and threats within and outside of the designated sites and practical challenges in implementing the national restoration ambition, such as fragmented land ownership and untraceable landowners. Addressing these issues while continuing the National Raised Bog Restoration Programme could substantially improve FPs.

6 Recommendations

The current Article 17 reporting period (2019-2024) has recorded the first increase in the extent of ARB since reporting began. This highlights the progress that has been made in the last number of decades in conserving the habitat. Continued progress is expected with further increases anticipated in the next reporting period, due to the roll-out of the National Raised Bog Restoration Programme. However, achieving

Favourable status for ARB will require further measures in the short-term or indeed long-term. These include:

- the designation (and management) of the proposed new network of sites (two SACs and 25 NHAs)
- the preparation of SSCOs and site-specific restoration plans for sites proposed for designation
- investigations of non-designated high bog (and cutover) sites across the country, with a view to identifying sites of highest restoration potential. After initial desktop analysis of aerial imagery this is likely to include eco-hydrological modelling work and on-the-ground ecological surveys such as ecotope surveys
- the discontinuation of negatively impacting activities
- the development/establishment of projects aimed at incentivising the restoration/rehabilitation of cutovers in, and adjacent to raised bogs
- the development of protocols/management procedures aimed at reducing nitrogen emissions from agriculture, particularly in areas adjacent to raised bogs
- the further development of appropriate policy on forest to bog restoration projects on deep-peat soils
- the full implementation of the National Raised Bog Restoration Programme
- the expansion of the National Raised Bog Restoration Programme to non-designated sites, particularly to sites where restoration will not conflict with current landuses
- the continuation of the re-evaluation of restoration plans already developed for designated sites to potentially incorporate enhanced restoration works, such as bunding, considering the success of these works on suitable sites
- the re-evaluation of the two eco-hydrological models, that of the DRB model on the high bog and the bog peat-forming habitat model on the cutover, using the improved knowledge of both the ecological drivers and the outcomes from restoration works
- the re-evaluation of the SSCOs (particularly the targets for area and S&F) of each site, considering the increased knowledge of the sites' eco-hydrology, to ensure that the targets set are ambitious but realistic
- the continuation (and possibly expansion) of funding and support initiatives that communicate peatland restoration messages to the public and promote best practice among restoration practitioners.

7 References

Aherne, J., Henry J. & Wolniewicz M. (2017). Development of Critical Loads for Ireland: Simulating Impacts on Systems (SIOS) No. 197. EPA, Wexford.

BNM (2017). The Bord na Móna Biodiversity Action Plan (2016-2021).

BNM (2025). Cloonboley Bog Complex Ecotope Survey Report 2024. Report prepared by the Bord na Móna Ecology Team.

Bobbink, R. & Hettelingh, J.P. (2011). Review and revision of empirical critical loads and dose-response relationships. Proceedings of an expert workshop, Noordwijkerhout, 23-25 June 2010. RIVM report 680359002, Coordination Centre for Effects, National Institute for Public Health and the Environment (RIVM).

CEC (2013). Commission of the European Communities. Interpretation Manual of European Union Habitats, version EUR 28. DG Environment – Nature and Biodiversity. Brussels. Commission of the European Communities.

Climate Action Plan (2024). Ireland's Climate Action Plan 2024, Department of the Environment, Climate and Communications, Dublin. https://www.gov.ie/pdf/?file=https://assets.gov.ie/296414/7a06bae1-4c1c-4cdc-ac36-978e3119362e.pdf#page=null

Coll, J., Bourke, D., Gormally, M., Sheehy Skeffington, M. & Sweeney, J. (2013). Winners and Losers: Climate Change Impacts on Biodiversity in Ireland. Project Report. Environmental Protection Agency.

Cross, J.R. (1990). The Raised Bogs of Ireland: their Ecology, Status and Conservation. Department of Finance, Dublin.

Crowley, W., Smith, G.F., Mackin, F., Regan, S., Fernandez Valverde, F. & Eakin, M. (2021). Recovery of the vegetation of a cutover raised bog in Ireland following rewetting measures. Biology and Environment: Proceedings of the Royal Irish Academy **121**, No. 2, 95–121. DOI: 10.3318/ BIOE.2021.09

Crowley, W., Crushell, P., O'Sullivan, J., Smith, G. F. & Vanmechelen, A. (2023). An assessment of the impacts of restoration works on the vegetation of the high bog and cutover at Cloncrow Bog NHA in County Westmeath. Report to the National Parks and Wildlife Service.

Crowley, W. & Fernandez Valverde, F. (2021). Habitat survey of the cutover at Scohaboy Bog. Report prepared for the Cloughjordan Community Development Committee and the National Parks and Wildlife Service.

Crowley, W. & Smith, G.F. (2022). Restoring Active Raised Bog in Ireland's SAC Network 2016 – 2020 (LIFE14 NAT/IE/000032): D2: Vegetation Monitoring Final Report. The Living Bog Project/National Parks and Wildlife Service, Ireland. (https://www.raisedbogs.ie/wp-content/uploads/2022/09/Appendix-7-D2-Vegetation-Monitoring-Final-Report.pdf)

Crushell, P., Connolly, A., Schouten, M., & Mitchell, F.J. (2014). The changing landscape of Clara Bog: the history of an Irish raised bog. Irish Geography, **41(1)**, 89-111. https://doi.org/10.55650/igj.2008.111

Crushell, P.H., Crowley, W., Denyer, J., Foss, P., Gallagher, M.C., MacGowan, F. & Smith, G. (2019). NHA Raised Bog Monitoring Project 2018. National Parks & Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Dublin.

Crushell, P., Gallagher, M.C. & Foss, P. (2021) Title: County Leitrim Wetlands Field Survey 2021. Report prepared for Leitrim County Council.

Crushell, P., Crowley, W., Vanmechelen, A., Kirwan, B. & Foss, P.J. (2022). County Tipperary Wetlands Survey. Mapping Project and Field Survey 2022. Report prepared for Tipperary County Council.

Crushell, P., Crowley, W., Vanmechelen, A., O'Sullivan, J. & Foss, P. (2023). County Tipperary Wetlands Field Survey II 2023. Report prepared for Tipperary County Council.

Crushell, P., Crowley, W., Delaney, E., Gallagher, M.C., O'Sullivan, J. Smith, G.F. & Vanmechelen, A. (2024a). Ecotope Mapping within a sub-set of designated raised bogs. A report to the National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Dublin.

Crushell, P., Crowley, W., Vanmechelen, A., O'Sullivan, J., Overy, P. & Foss, P. (2024b). County Tipperary Wetlands Field Survey III 2024. Report prepared for Tipperary County Council.

Crushell, P., Crowley, W., Vanmechelen, A., O'Sullivan, J., Overy, P. & Foss, P. (2024c). County Cavan Wetlands Field Survey II 2024. Report prepared for Cavan County Council.

Crushell, P., Crowley, W., Vanmechelen, A., O'Sullivan, J., Overy, P. & Foss, P. (2024d). County Leitrim Wetlands Field Survey III 2024. Report prepared for Leitrim County Council.

Cushnan, H., O'Hara, S., Kieran, P. & Mackin., F. (2022). Restoring Active Raised Bog in Ireland's SAC Network 2016 – 2020 (LIFE14 NAT/IE/000032): LIFE Technical Manual – Review of Best Practice Measures. The Living Bog Project/National Parks and Wildlife Service, Ireland.

https://raisedbogs.ie/wp-content/uploads/2022/09/Appendix-23-E10-LIFE-Projects-Technique-Manual-D01.docx.pdf

DAFM (2022). Agri-Climate Rural Environment Scheme (ACRES), Department of Agriculture, Food and the Marine, Johnstown Castle Estate, Wexford. https://www.gov.ie/pdf/?file=https://assets.gov.ie/236542/3dd1dd2d-bf1a-43bf-a78d-62d8046d43f8.pdf

DAFM (2024). Land Types for Afforestation: Soil and Fertility, Department of Agriculture, Food and the Marine, Johnstown Castle Estate, Wexford

DAFM (2025). Targeted Agricultural Modernisation Scheme (TAMS 3), Low Emission Slurry Spreading Scheme, Department of Agriculture, Food and the Marine, Johnstown Castle Estate, Wexford. https://www.gov.ie/en/service/7342f-low-emission-slurry-spreading-scheme/

Derwin, J. & MacGowan, F. (2000). Raised Bog Restoration Project: A Continuation of the Investigation into the Conservation and Restoration of Selected Raised Bog Sites in Ireland. Unpublished report, Dúchas the Heritage Service, Dublin.

Desmond, M., O'Brien, P. & McGovern, F. (2017). A Summary of the State of Knowledge of Climate Change Impacts for Ireland. CCRP Report No. 223.Environmental Protection Agency, Johnstown Castle, Ireland.

DG Environment (2017). Reporting under Article 17 of the Habitats Directive: Explanatory notes and guidelines for the period 2013-2018. Brussels.

DG Environment (2022). Reporting format referred to in Article 17 of Directive 92/43/EEC (Habitats Directive)..

DG Environment (2023a). Reporting under Article 17 of the Habitats Directive: Guidelines on concepts and definitions – Article 17 of Directive 92/43/EEC, Reporting period 2019-2024. Brussels.

DG Environment (2023b). List of pressures and threats for the period 2019-2024.

DG Environment (2023c). List of conservation measures for the period 2019-2024.

DHLGH (2021). National Peatlands Strategy Mid-Term Review. Department of Housing, Local Government and Heritage, Dublin. https://www.npws.ie/sites/default/files/files/EN%20National%20Peatlands%20Strategy%20Mid-Term%20Review.pdf

Donnelly, A., Caffarra, A., Albanito, F. & Jones, M. (2008). "The impact of climate change on semi-natural ecosytems in Ireland (Chapter 5)". In Climate change in Ireland: Refining the impacts, Edited by: Sweeney, J. 132–159. Dublin: Environmental Protection Agency.

EPA (2018). Ireland's transboundary gas emissions 1990–2016. Environmental Protection Agency, Johnstown Castle, Wexford.

EPA (2024). Ireland's State of the Environment Report 2024. Environmental Protection Agency, Johnstown Castle, Wexford.

Evans, D. & Arvela, M. (2011). Assessment and Reporting Under Article 17 of the Habitats Directive: Explanatory Notes & Guidelines for the period 2007-2011, Final Draft 2. European Commission, DG Environment. https://circabc.europa.eu/sd/d/2c12cea2-f827-4bdb-bb56-3731c9fd8b40/Art17%20-%20Guidelines-final.pdf

Fernandez, F. & Eakin, M (in prep.). Active raised bog, Degraded raised bog and Rhynchosporion depressions conservation status assessment for the 2013-2018 period. A report to the National Parks & Wildlife Service.

Fernandez, F., Fanning, M., McCorry, M. & Crowley, W. (2005). Raised Bog Monitoring Project 2004-5. Unpublished report, National Parks & Wildlife Service, Department of Environment, Heritage and Local Government, Dublin.

Fernandez, F., MacGowan, F., Crowley, W., Farrell, M., Croal, Y., Fanning, M. & McKee, M. (2006). Assessment of the Impacts of turf cutting on designated Raised Bogs 2003-06. Unpublished report, National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin.

Fernandez, F. Crowley, W. & Wilson S. (2009) Clara Bog high bog ecological survey. National Parks & Wildlife Service, Department of Environment, Heritage and Local Government, Dublin.

Fernandez, F. Crowley, W. & Wilson S. (2012) Raised Bog Monitoring Survey. National Parks & Wildlife Service, Department of Environment, Heritage and Local Government, Dublin.

Fernandez, F., Connolly, K., Crowley, W., Denyer J., Duff, K. & Smith, G. (2014). Raised bog monitoring and assessment survey 2013. Irish Wildlife Manuals, No. 81. National Parks and Wildlife Service, Department of Arts, Heritage and Gaeltacht, Dublin, Ireland.

Finney, K., Sweeney K., Mulligan M., Gilligan M., Sweeney S., Healey A. & Donaghy A. (2024). The Irish Breeding Curlew EIP Project Report 2024. BirdWatch Ireland Unpublished Report.

Foss, P.J., Kirwan, B. & Crushell, P. (2020). County Kilkenny Wetland Survey I. Report for Kilkenny County Council. pp. 205.

Fossitt, J.A. (2000). A guide to habitats in Ireland. The Heritage Council, Kilkenny.

Hammond, R.F. (1979). The Peatlands of Ireland. An Foras Talúntais, Dublin.

Henry, J. & Aherne, J. (2014). Nitrogen deposition and exceedance of critical loads for nutrient

nitrogen in Irish grasslands. Science of the Total Environment 470–471: 216–223.

Kelleghan, D.B., Hayes, E.T., Everard, M. & Curran, T.P. (2019). Mapping ammonia risk on sensitive habitats in Ireland. Science of the Total Environment **649**, 1580-1589. https://doi.org/10.1016/j.scitotenv.2018.08.424

Kelleghan, D.B., Hayes, E.T., Everard, M. & Curran, T.P. (2020). Assessment of the impact of ammonia emissions from intensive agriculture on special areas of conservation and special protection areas. EPA Research Report No. 347. Wexford, Ireland. Environmental Protection Agency.

Kelleghan, D.B., Hayes, E.T., Everard, M., Keating, P., Lesniak-Podsiadlo, A. & Curran, T.P. (2021). Atmospheric ammonia and nitrogen deposition on Irish Natura 2000 sites: Implications for Irish agriculture. Atmospheric Environment **261**, 118611

Kelleghan, D.B., Fogarty, M., Welchman, S., Cummins, T., & Curran, T.P. (2022). Agricultural atmospheric ammonia: identification & assessment of potential impacts. Irish Wildlife Manuals, No. 135. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.

Kelly, L., Doak, M. & Dromey, M. (1995). Raised Bog Restoration Project: An Investigation into the Conservation and Restoration of Selected Raised Bog Sites in Ireland. National Parks & Wildlife Service, Department of Environment, Heritage and Local Government, Dublin.

Kelly, L. & Schouten, M.G.C. (2002). Vegetation. In: M. G. C. Schouten (Ed.), Conservation and Restoration of Raised Bogs: Geological, Hydrological and Ecological Studies. pp.110-169, Department of Environment and Local Government, Dublin, Ireland/Staatabosbeheer, The Netherlands.

Mackin, F., Barr, A., Rath, P., Eakin, M., Ryan, J., Jeffrey, R. & Fernandez-Valverde, F. (2017a). Best practice in raised bog restoration in Ireland. Irish Wildlife Manuals, No. 99. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland.

Mackin, F., Flynn, R., Barr. A. & Fernandez-Valverde, F. (2017b). Use of geographical information system-based hydrological modelling for development of a raised bog conservation and restoration programme. Ecological Engineering, **106**: 242–252.

Malmer, N. & Wallén, B. (2005). Nitrogen and phosphorus in mire plants: variation during 50 years in relation to supply rate and vegetation type. Oikos, **109**: 539–554.

NPWS (2007). The status of EU protected habitats and species in Ireland. Volume (3). Unpublished report, National Parks & Wildlife Service, Department of Environment, Heritage and Local Government, Dublin.

NPWS (2008). The Status of EU Protected Habitats And Species In Ireland. Conservation Status in Ireland of Habitats and Species listed in the European Council Directive on the Conservation of Habitats, Flora and Fauna 92/43/EEC. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government. Dublin.

NPWS (2013). The Status of EU Protected Habitats and Species In Ireland. Habitat Assessments Volume 2. Version 1.1. Unpublished Report, National Parks & Wildlife Service, Department of Arts, Heritage and the Gaeltacht. Dublin, Ireland.

NPWS (2014). Review of Raised Bog Natural Heritage Area Network. National Parks and Wildlife Services, Department of Arts, Heritage and the Gaeltacht. Dublin. https://www.npws.ie/sites/default/files/general/Final%20NHA%20Review%2017%20January%202014.pdf).

NPWS (2015). National Peatlands Strategy 2015. National Parks and Wildlife Services, Department of Arts, Heritage and the Gaeltacht. Dublin. https://www.npws.ie/sites/default/files/publications/pdf/NationalPeatlandsStrategy2015EnglishVers.pdf

NPWS (2017). National Raised Bog Special Areas of Conservation Management Plan 2017-2022. National Parks & Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Dublin, Ireland. https://www.npws.ie/sites/default/files/general/national-raised-bog-sac-management-plan-en.pdf

NPWS (2019). The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments. Unpublished NPWS report. Edited by: Deirdre Lynn and Fionnuala O'Neill.

NPWS (2023). Derragh Bog SAC (site code 002201) Conservation objectives supporting document - raised bog habitats Version 1. National Parks & Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.

O'Loughlin, B. (2022). Peatland Restoration: Raised Bog Ecotope and Cutover Habitat Survey of Shanakyle Bog, Co. Clare. Report prepared for the Department of Agriculture, Food and the Marine (DAFM) and Shanakyle Bog Restoration Group.

Posthumus, A.C. (1988). Critical levels for effects of ammonia and ammonium. In Proceedings of the Bad Harzburg Workshop (pp. 117-127). UBA Berlin.

Ryan, J. & Cross, J. (1984). The Conservation of Peatlands in Ireland. Proceedings of the 7th International Peat Congress, pp. 389-406, Dublin.

Schaaf, S. van der & Streefkerk, J. (2002). Relationship between biotic and abiotic conditions. In: M.G.C. Schouten (Ed.), Conservation and Restoration of Raised Bogs: Geological, Hydrological and Ecological Studies, pp.186-209, Department of Environment and Local Government, Dublin, Ireland/Staatabosbeheer, The Netherlands.

Schouten, M.G.C. (2002). Conservation and Restoration of Raised Bogs: Geological, Hydrological and Ecological Studies, Department of Environment and Local Government and Geological Survey of Ireland, Staatabosbeheer, The Netherlands.

Smith, G.F. (2024). Cloonbar Ecological Survey. Report prepared for Friends of Kilconly Wetlands.

Smith, G.F. & Crowley, W. (2020). The habitats of cutover raised bog. Irish Wildlife Manuals, No. 128. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland. https://www.npws.ie/sites/default/files/publications/pdf/IWM128.pdf

Smith, G.F., O'Donoghue, P., O'Hora, K. & Delaney, E. (2011). Best Practice Guidance for Habitat Survey and Mapping. The Heritage Council, Kilkenny, pp. 133.

https://www.heritagecouncil.ie/content/files/best_practice_guidance_habitat_survey_mapping_onscreen_version_2011_8mb.pdf

Tomassen, H.B.M., Smolders, J.P., Limpens, J., Lamers, L.P.M. & Roelofs, J.G.M. (2004) Expansion of invasive species on ombrotrphic bogs: desiccation or high N deposition? Journal of Applied Ecology **41**, 139–50.

UNECE (2007). Report on the Workshop on Atmospheric Ammonia: Detecting Emission Changes and Environmental Impacts.

Appendix 1 Deliverables under MARBMP 2021-24

- ESRI-compatible shapefiles in Irish Transverse Mercator (ITM) projection of all GIS data collected and developed during the surveys such as ecotope points, boundary points, ecotope polygons and quadrats/monitoring stops. This includes data from the *MARBMP* and *EMP* surveys as well as that from the bogs for which a conservation condition assessment was undertaken as part of *MARBMP*, which were surveyed by *The Living Bog* in 2020-21.
- Photographs (*.jpg) of raised bog habitat, monitoring stops and impacts, and Image catalogue (Microsoft Excel spreadsheet) detailing the photographs taken during this survey.
- Excel spreadsheet containing all the data from quadrats/monitoring stops.
- Site condition assessment reports for 36 sites including 21 SACs, 13 NHAs and two non-designated sites. These sites encompass 45 bogs in total.
- ESRI-compatible shapefiles in ITM projection of all GIS data collected as part of the estimation of the national ARB extent detailed in section 2.1.

Appendix 2 Spatial datasets updated or created as part of the assessment

The first two spatial datasets below have been updated from that generated by Fernandez and Eakin (in prep.). The third dataset was generated as part of this assessment.

- AR1725_RBs_Ecotopes_distribution.shp. This layer provides polygon data illustrating habitats depicted based on the ecotope vegetation classification. The layer's attribute table contains the following fields: [Site_Name]; [Site_Code]; [Designatio]: designation type (e.g. SAC, NHA, cSAC); [County]; [Survey_Nam]: survey name; [Survey_Date]; [Survey_Met]: survey method (e.g. field surveys); [Authors]: map authors; [Ecotope]: ecotope type; [Name]: specific active peat forming area name; [Trend]: additional info related to each active peat forming record, whether it is newly developed, has expanded or decreased; [Comment]: additional related to some specific polygons and [Area]: polygon area (m^2).
- AR1725_RBs_NoEcotopeAvailable_distribution.shp. This layer provides polygon data for "intact" raised bog areas both designated and non-designated for which detail ecotope data is not available. The layer's attribute table contains the following fields: [Site_Name]; [Site_Code]; [Designatio]: designation type (e.g. SAC, NHA, N/A); [County]; [Source]: data source; [Authors]: source authors; [Survey_Met]: survey method (e.g. desktop, field surveys); [Survey_Date]; [Other_Sour]: additional data source; [Comment]: additional info related to the occurrence of ARB or DRB habitat within the polygon (e.g. approximate extent); [Area]: polygon area (m^2); [ARB1]: is ARB present, absent or unknown in 2018; [ARB2]: ARB approximate extent in hectares in 2018, [ARB25_1]: is ARB present, absent or unknown in 2025; [ARB25_2]: ARB approximate extent in hectares in 2025: [DRB1]: is DRB present, absent or unknown in 2018: [DRB25_1]: is DRB present, absent or unknown in 2025: [Bog Name]; [Asssess2025]; any update on the ARB assessment within the polygon in 2025.

- AR1725_ARB_onCutover_distribution.shp. This layer provides polygon data for those *Sphagnum*-rich areas of cutover that are classed as ARB according to the criteria developed by Smith and Crowley (2020). The layer's attribute table contains the following fields: [Site_Code]; [Bog_Name] (when applicable); [Designatio]: designation type (e.g. SAC, NHA); [County]; [Source]: data source; [Authors]: source authors; [Survey_M]: survey method (e.g. desktop, field surveys); [Source_D] date of source; [Comment]: additional info related to each individual record; [Area]: polygon area (m^2); [Bog_ID].

In addition, the following 10km grid cells shapefiles were also updated from that generated by Fernandez and Eakin (in prep.) to generate the current distribution, range and FRR maps:

- AR1725_7110_CD: giving the current distribution of habitat 7110
- AR1725_7110_CR: giving the current range of habitat 7110
- AR1725_7110_FRR: giving the Favourable Reference Range of habitat 7110
- AR1725_7120_CD: giving the current distribution of habitat 7120
- AR1725_7120_CR: giving the current range of habitat 7120

Appendix 3 Ecotope and Community Complex Key

The following is an approximate guide (adapted from Fernandez *et al*., 2005 by Crushell *et a*l., 2024a) designed to aid the keying out of high bog ecotopes and in turn community complexes on Irish raised bogs. It should be realised that no dichotomous key is perfect and where the key does not seem to work, the community complex descriptions in Appendix 22 should be reviewed to see what complex is the best fit.

Note that this key was designed for the purpose of mapping *relatively* homogenous areas of >400 m^2. The following attributes are considered to define a community complex: vegetation composition and cover: *Sphagnum* cover, robustness of *Calluna vulgaris*, presence of *Cladonia* species; ground firmness (firm, soft, very soft, quaking); acrotelm depth and micro-topography (e.g. flats, lawns, hollows, pools, hummocks). The communities are given numeric names according to the dominant or characteristic species. A more comprehensive description of the community complexes is given in Appendix 22. This raised bog vegetation classification is based on the work of Kelly *et al*. (1995).

Key

1. Western indicators *Racomitrium lanuginosum*, *Campylopus atrovirens*, *Pleurozia purpurea* and large pools with frequent open water all **present (at least two of the three indicators present)** ..... **Use Western Ecotopes Key**

   Western indicators *Racomitrium lanuginosum*, *Campylopus atrovirens, Pleurozia purpurea* and large pools with frequent open water **absent (or only one of the three indicators present)** .... **Use Midland Ecotopes Key**

Midland Ecotopes Key

1. *Sphagnum* cover >40% **2**

   Sphagnum cover ≤40% ..... **Use Non-ARB Ecotopes Key**

2. Pools cover ≥20%. **3**

   Pools cover <20%. **4**

3. *Sphagnum* cover ≥75% ..... **(CENTRAL) *COMPLEX 14***

   Sphagnum cover 41-75% **6**

4. Pools cover 11-20%. **5**

   Pools cover <10%. 11

5. *Sphagnum* cover ≥75% ..... **(CENTRAL) *COMPLEX 15***

   Sphagnum cover 41-75% **6**

6. *Narthecium* cover ≥10% **9**

   Narthecium cover <10% **7**

7. *Eriophorum* spp cover ≥15% ..... **(SC) *COMPLEX 9/7+P***

Eriophorum spp cover <15% and *Rhynchospora alba* cover ≥10% ..... **(SC) *COMPLEX 4+P***

8. *Rhynchospora alba* cover <10% ..... **(SC) *COMPLEX 9/7+P***

   Rhynchospora alba cover >10% ..... **(SC) *COMPLEX 9/7/4+P***

9. *Eriophorum* spp cover ≥10% ..... **(SC) *COMPLEX 6/9+P***

   Eriophorum spp cover <10% **10**

10. *Rhynchospora alba* cover ≥10% ..... **(SC) *COMPLEX 6/4+P***

    Narthecium cover >20% (interpool conditions relatively dry, *Sphagnum* cover <50% and dominated by *S. rubellum*) **Consider SM options (Use Non-ARB Ecotopes Key)**

11. *Sphagnum* cover ≥75% **12**

    Sphagnum cover 41-75% **17**

12. Pools present (though often more like *Sphagnum cuspidatum* filled hollows) AND at least some microtopographical variation **(CENTRAL) *COMPLEX 10/15***

    Pools absent **13**

13. 'Wetter'-loving Sphagna (e.g. *Sphagnum papillosum*, *S. medium* and/or *S. cuspidatum* dominate the *Sphagnum* layer **14**

    Conditions are relatively dry and *Sphagnum rubellum* dominates *Sphagnum* layer (though 'wetter' loving Sphagna are present) .... **(SC) *COMPLEX 9/7/10***

14. *Eriophorum* spp cover ≥15% ..... **(SC) *COMPLEX 10/9***

    Eriophorum spp cover <15% **15**

15. *Rhynchospora alba* cover ≥15% ..... **(SC) *COMPLEX 10/4***

    Rhynchospora alba cover <15% **16**

16. *Narthecium* cover ≥15% ..... **(SC) *COMPLEX 10/6***

    Narthecium cover <15% **Consider most suitable option between 10/9, 10/6 and 10/4**

17. Pools present **6**

    Pools rare or absent **18**

18. 'Wetter'-loving Sphagna (e.g. *Sphagnum papillosum*, *S. medium* and/or *S. cuspidatum* dominate the *Sphagnum* layer **19**

    Conditions are relatively dry, *Sphagnum rubellum* dominates *Sphagnum* layer and *Calluna vulgaris* cover usually >33% **23**

19. *Eriophorum* spp cover ≥15% ..... **(SC) *COMPLEX 9/10***

    Eriophorum spp cover <15% **20**

20. *Rhynchospora alba* cover ≥15% ..... **(SC) *COMPLEX 4/10***

Rhynchospora alba cover <15%..... **21**

21. *Narthecium* cover ≥15% ..... **(SC) *COMPLEX 6/10***

    Narthecium cover <15% **22**

22. *Carex panicea* cover ≥15% ..... **(SC) *COMPLEX 3/10***

    Carex panicea cover <15%**Consider most suitable option between 9/10, 6/10 and 4/10**

23. *Sphagnum* >50% cover and species other than *S. rubellum* and *S. tenellum* are present at some cover value (i.e. >5%)..... **(SC) *COMPLEX 9/7/10***

    Sphagnum <50% cover ..... **Consider SM *Complex 9/7***

Western Ecotopes Key

1. Pools >20% cover **6**

   Pools <20% cover **2**

2. Pools 11-20% cover **3**

   Pools ≤10% cover ..... **Use Midland ARB Ecotopes key**

3. *Sphagnum* cover ≥30% cover **4**

   Sphagnum cover <30% cover ..... **Use Non-ARB Ecotopes Key**

4. *Narthecium ossifragum* >10% cover..... **5**

   Narthecium ossifragum ≤10% cover (*Eriophorum* spp > 10% cover and *Carex panicea* > 10% cover)..... **(SC) *COMPLEX 3/9+P***

5. *Eriophorum* spp >10% cover ..... **(SC) *COMPLEX 6/9+P***

   Rhynchospora alba >10% cover ..... **(SC) *COMPLEX 6/4+P***

6. *Sphagnum* cover >40% cover ..... **(CENTRAL) *COMPLEX 35***

   Sphagnum cover ≤40% cover **7**

7. *Sphagnum* cover 21-40% cover **8**

   Sphagnum cover ≤20% cover ..... **Use Non-ARB Ecotopes Key**

8. *Narthecium ossifragum* cover >15% cover..... **(SC) *COMPLEX 6/35***

   Carex panicea cover >15% cover ..... **(SC) *COMPLEX 3/35***

   Rhynchospora alba cover >15% cover ..... **(SC) *COMPLEX 4/35***

Non-ARB Ecotopes Key (Generally areas with a *Sphagnum* cover ≤40%)

1. Pools cover ≥10% **2**

   Pools cover <10% or absent **6**

2. *Eriophorum* spp >10% cover.....**3**
   Eriophorum spp ≤10% cover.....**5**
3. *Carex panicea* cover > *Narthecium* cover..... **(SM) 9/7/3+P**
   Carex panicea cover < *Narthecium* cover.....**4**
4. *Narthecium* >10% cover..... **(SM) 9/7/6+P**
   Trichophorum ≥10% cover..... **(SM) 9/7/2+P**
5. *Carex panicea* cover > 10% cover..... **(SM) 6/3+P**
   Narthecium > 15% cover..... **(SM) 6+P**
6. *Eriophorum* spp ≥15% cover (and *Sphagnum* usually ≥30% cover).....**7**
   Eriophorum spp <15% cover (and *Sphagnum* usually <30% cover).....**11**
7. *Narthecium* <5% cover (Hummock dominated and hollows/flats/lawns/pools largely absent, *Sphagnum* cover c. 40% sometimes higher)**(SM) Complex 9/7**
   At least some hollows or flats present.....**8**
8. Hollows or depressions frequent.....**9**
   Flats frequent.....**10**
9. *Rhynchospora alba* >10% cover.....**(SM) Complex 9/7/4**
   Narthecium >10% cover.....**(SM) Complex 9/7/6**
10. *Carex panicea* >10% cover.....**(SM) Complex 9/7/3**
    Trichophorum ≥10% cover.....**(SM) Complex 9/7/2**
11. *Sphagnum* >10% cover.....**12**
    Sphagnum ≤10% cover.....**15**
12. *Narthecium* >15% cover.....**13**
    Narthecium ≤15% cover.....**14**
13. *Rhynchospora alba* >10% cover.....**(SM) Complex 6/4**
    Carex panicea >10% cover.....**(SM) Complex 6/3**
    None of the above and *Calluna vulgaris* 30-50% cover .....**(SM) Complex 7/6**
14. *Rhynchospora alba* >15% cover.....**(SM) Complex 4/7**
    Calluna vulgaris >75% cover (*Eriophorum* spp. the next most frequent vascular plant and the *Sphagnum* cover >20%) .....**(SM) Complex 7/9**
15. Moderate to steep slope with frequent to abundant *Trichophorum* (>10% cover) **17**
    Gentle to moderate (or no) slope and *Trichophorum* not a major component of vegetation (<5% cover) **16**
16. Aside from *Calluna*, *Narthecium* is the most abundant plant **(M) Complex 6/7**
    Aside from *Calluna*, *Carex panicea* is the most abundant plant**(M) Complex 3/6**
17. *Calluna vulgaris* cover >40% ..... **(M) Complex 2/7**
    Carex panicea cover >15%..... **(M) Complex 2/3**
    Rhynchospora alba prominent in erosion/run-off channels ... **(M) Complex 2/4**

Appendix 4 Community Complex descriptions

The following is a brief description of the main features that distinguish each community complex from each other taken from Crushell *et a*l., 2024a. Community complexes often merge or grade into each other and can be difficult to identify and map in the field. The following descriptions give the typical characteristics of each community complex and the actual characteristics on the ground may vary slightly. A summary list of the ARB and non-ARB complexes described is given in the tables below (along with some of the general features of each ecotope) and a key to help identify each complex is given in Appendix 21.

List of ARB community complex types in key and summarised below. Those given in brackets are considered variants of the complex they follow.

	Central	Sub-central	
Midland & Western sites	14 15 10/15	9/7+P (9/7/4+P) 4+P 6/4+P 6/9+P 3/9+P	10/9 (10/9a) (9/10) 10/4 (4/10) 10/6 (6/10) 3/10 (10/3) 9/7/10
Western sites only	35	6/35 (4/35) (3/35)	

List of non-ARB community complex types in key and summarised below. Those give in brackets are considered variants of the complex they follow.

	Sub-marginal	Marginal
Midland & Western	9/7/6+P (9/7/3+P & 9/7/2+P) 6+P (6/3+P) 9/7 (7/9) 9/7/6 (9/7/4, 9/7/3 & 9/7/2) 6/4 6/3 (6/3/9) 4/7 7/6 (7/6/4 & 7/6/3)	3/6+P 6/7 (6/7/3 & 6/7/2) 3/6 (3/6/2, 3/6/4 & 3/6/7) 2/7 (2/4 & 2/3) 1

Summary characteristics of general ecotopes on high bog. Note that these are indicative values only and the key and general descriptions should be referred to for further detail.

Ecotope	*Sphagnum* cover (%)	Micro-topography	Pool Cover (%)	Firmness	Characteristic species
Central	>75 (>40% on western sites)	Hummocks, hollows, lawns and pools	>10%	Quaking	*Sphagnum* species abundant. Pools support *Drosera anglica* (or sometimes *D. intermedia* in western sites)
Sub-central	>40 (>30% on western sites)	Hummocks, hollows, lawns and (usually) pools	Absent or <20%	Very soft	*Sphagnum* species abundant. An abundance of *S. medium* sometimes characterises this ecotope. Pools often support *Drosera anglica*
Sub-marginal	11-40	Hummocks and hollows (occasionally pools)	Absent or <10%	Soft	*Narthecium ossifragum* may be abundant
Marginal	≤10	Poorly differentiated. Often dominated by flats. Occasionally wet hollows or tear pools	Largely absent	Firm	*Calluna vulgaris*, *Carex panicea* and/or *Trichophorum germanicum* may be abundant.
Facebank	≤10	None	Absent	Firm	Vigorous *Calluna vulgaris* growth

Central Ecotope Complexes

Complex 14

Microtopography: Hummocks, hollows and pools (>20% cover) and sometimes lawns.

***Sphagnum* cover**: >75%

Firmness: Quaking

Characteristic species: *Sphagnum cuspidatum* (>20% cover)

Description: Apart from some soak areas, this central ecotope complex indicates the wettest conditions on the high bog. Quaking mats of *Sphagnum* characterise this complex with *S. cuspidatum*-filled pools covering >20% of the complexes surface area. The pools support *Eriophorum angustifolium*, *Drosera anglica* and *Menyanthes trifoliata* with *Rhynchospora alba* around the pool edges and in patches within the pools. Algae is largely absent from the pools. The inter-pool areas usually support frequent hummocks of *Sphagnum rubellum* as well as hummocks of *S. beothuk* and *S. austinii*. *S. papillosum* and *S. medium* are also frequent usually occurring in lawns and replacing *S. cuspidatum* as the dominant *Sphagnum* towards the edges of the complex. *Calluna vulgaris* (11-20%) and *Eriophorum vaginatum* (5-10%) are found at relatively low cover values on the hummocks with *Narthecium ossifragum* and *Erica tetralix* also present, but at a lower cover value (ca. 5%). The overall *Sphagnum* cover is 75-100% (usually >90%).

Similar Complexes: This complex differs from Complex **15** in that pools are more frequent. Where pools are less distinct, the complex may grade into Complex **10/15**. Where the *Sphagnum* cover is poorer, the complex grades into the sub-central ecotope.

Annex habitats: As well as supporting the Priority Annex habitat Active Raised Bog (7110), this complex usually supports the Annex habitat “Depressions on peat substrates of the Rhynchosporion” (7150).

Complex 15

Microtopography: Hummocks, hollows and pools (11-20% cover) and sometimes lawns.

***Sphagnum* cover**: >75%

Firmness: Very soft or quaking

Characteristic species: *Sphagnum cuspidatum* (>10% cover)

Description: This is a wet central ecotope complex that is characterised by scattered *Sphagnum cuspidatum*-filled pools usually covering 11-20% of the complex’s surface area. The bog surface is very soft and sometimes quaking. The pools support *Eriophorum angustifolium*, *Drosera anglica* and *Menyanthes trifoliata* with *Rhynchospora alba* around the pool edges and in patches within the pools. There can be very occasional patches of algae and/or open water in the pools. The inter-pool areas usually support frequent hummocks of *Sphagnum rubellum* (usually 10-20% cover) as well as hummocks of *S. beothuk* and *S. austinii*. *S. papillosum* and *S. medium* are also frequent (20-40% cover or higher) and usually dominate around the pool edges, and also occur in lawns as well as low hummocks. *S. cuspidatum* cover is usually high (>10% cover and usually >20% over). *Calluna vulgaris* (11-20%) and *Eriophorum vaginatum* (5-10%) are found at relatively low cover values on the hummocks with *Narthecium ossifragum* and *Erica tetralix* also present, but at a lower cover value (ca. 5%).

Similar Complexes: This complex differs from Complex **14** in that pools are less frequent. Where pools are less distinct, the complex may grade into Complex **10/15**. Where the *Sphagnum* cover is poorer, the complex grades into the sub-central ecotope.

Annex habitats: As well as supporting the Priority Annex habitat Active Raised Bog (7110), this complex usually supports the Annex habitat “Depressions on peat substrates of the Rhynchosporion” (7150).

Complex 10/15

Microtopography: Hummocks, hollows and lawns with pools (<10% cover)

***Sphagnum* cover**: >75%

Firmness: Very soft (at times quaking)

Characteristic species: *Sphagnum medium* and *S. cuspidatum* co-dominate the lawns/pools

Description: This is a central ecotope complex and the bog surface is usually very soft underfoot and at times quaking. The micro-topography is less well developed than in other central ecotope complexes and characterised by low hummocks, lawns and pools. However, the pools can be more like *Sphagnum* filled hollows/lawns than pools with *S. cuspidatum* and *S. medium* usually dominating in them. *S. medium* is usually a larger component of this complex than it is in Complex 14 or 15. *Rhynchospora alba* is also more frequent than in Complex 14 or 15 occurring at c. 10% cover, mostly across the *Sphagnum* lawns and/or pools. *Sphagnum papillosum* can also be prominent in this complex and occurs in lawns and low hummocks particularly at pool margins (where the pools are more distinct). *Eriophorum vaginatum* often grows abundantly across the *Sphagnum* lawns, usually occurring at >10% cover. *Calluna vulgaris* (11-20%) grows on hummocks, which are usually composed of *S. papillosum* and *S. rubellum* with occasional *S. austinii* and *S. beothuk*. *Narthecium ossifragum* is usually present at a low cover value (ca.5%) but can increase towards the margins of the complex.

Similar Complexes: This central Complex 10/15 can be difficult to differentiate from the sub-central Complex **10/9**. In 10/15, there is at least some variation in microtopography with hummocks being somewhat distinct from lawns and pools etc. whereas this distinction is not always clear in Complex 10/9. *Drosera anglica* and *Menyanthes trifoliata* can be relatively frequent in 10/15 but are usually rare or absent in 10/9. Some taller hummocks of *Sphagnum austinii* and *S. beothuk* may also be present in 10/15 and hummocks in general usually account for >25% of cover while in 10/9 cover of hummocks is usually less. Complex 10/15 also tends to have at least some quaking element while 10/9 does not. *Eriophorum* spp. usually occur at >10% cover in both complexes but tend to be more abundant in 10/9 (usually being by the far the most dominant vascular plant), sometimes reaching cover values of >30%.

Complex 10/15 can also be difficult to differentiate from the sub-central Complex **10/4**. Again in 10/15, there is greater variation in microtopography with hummocks being distinct from lawns and pools etc. Some taller hummocks of *Sphagnum austinii* and *S. beothuk* may also be present in 10/15 and 10/15 tends to have at least some quaking element while 10/4 does not. *Rhynchospora alba* tends to have a higher cover value in 10/4 (often >20%) than in 10/15 (usually 5-10%).

Annex habitats: As well as supporting the Priority Annex habitat Active Raised Bog (7110), this complex usually supports the Annex habitat “Depressions on peat substrates of the Rhynchosporion” (7150).

Complex 35

Microtopography: Pools (>20%), flats and hummocks

***Sphagnum* cover**: >40%

Firmness: Very soft or quaking

Characteristic species: *Racomitrium lanuginosum* and *Campylopus atrovirens*

Description: This is the wet central ecotope complex of western raised bogs. Pools are frequent, covering >20% of the complexes surface area, but tend to differ from the pools of the midland raised bogs in a number of ways. Firstly, they tend to be deeper and more elongate and inter-connecting. Secondly, open water is much more visible and predominates in many pools. Thirdly, although *S. cuspidatum* is still present, *S. auriculatum* is much more frequent than in the midland bogs and is sometimes the most common of the aquatic Sphagna. Where the pools are shallower there is a higher cover of *Sphagnum cuspidatum* and pools sometimes contain scattered *Rhynchospora alba*, *Eriophorum angustifolium*, *Drosera anglica* and *Menyanthes trifoliata* and some algal patches are present, but not dominant. *Campylopus atrovirens* is usually present at the pool margins along with *Sphagnum papillosum*. Island hummocks of *Racomitrium lanuginosum* are also common. The inter-pool vegetation has a much poorer *Sphagnum* cover than in the midland raised bogs with *Narthecium ossifragum* flats often dominating. Hummocks are present, however, with *S. austinii*, *S. beothuk* and *S. rubellum* occurring. The overall *Sphagnum* cover is often much lower than in the midland raised bog central complexes and can be as low as 40%. *S. papillosum* is usually the most abundant *Sphagnum*. *Carex panicea* is also much more common on this central complex (10%) than in the midland central complexes where it is usually absent or present in very low amounts (<5%). *Eriophorum vaginatum* and *Calluna vulgaris* are usually present on hummocks.

Similar Complexes: Where *Narthecium ossifragum* flats reach cover values of >20%, the *Sphagnum* cover is usually slightly lower (21-40%) and the complex grades into the sub-central Complex **6/35**.

Annex habitats: As well as supporting the Priority Annex habitat Active Raised Bog (7110), this complex can support the Annex habitat “Depressions on peat substrates of the Rhynchosporion” (7150).

Sub-central Ecotope Complexes

Complex 9/7+P (and 9/7/4+P)

Microtopography: Hummocks, hollows and pools (>10% cover) and sometimes lawns.

***Sphagnum* cover**: >40% (usually 60-70%)

Firmness: Soft to very soft

Characteristic species: *Eriophorum* spp. (>15%) and *Sphagnum cuspidatum* (>10% cover)

Description: This is a sub-central complex in which the bog surface is generally soft with occasional quaking areas. The pools within this complex are small in size (usually not interconnecting) and the pool cover averages at c. 10%. These pools usually have a good cover (>75% of each pool) of *Sphagnum cuspidatum* with *Eriophorum angustifolium*, *Rhynchospora alba* and *Drosera anglica* also present. Occasionally the pools are not distinctive and appear more like *Sphagnum* filled lawns with *Narthecium ossifragum* often found scattered throughout the *Sphagnum* pool/lawn patches. *S. papillosum* and *S. medium* are frequent at the pool margins and/or in lawns, and on some sites *S. pulchrum* is found. *Calluna vulgaris* (20-30%) and *Eriophorum vaginatum* (10-15%) are abundant and there are occasional large wide hummocks of *Sphagnum rubellum* and *S. austinii* with lower hummocks of *S. rubellum* frequent as well. *S. beothuk* can also occur as occasionally. The general *Sphagnum* cover is usually 60-70%.

Variants: Where *Rhynchospora alba* is prominent and has a cover of >10%, the complex is distinguished as Complex **9/7/4+P**.

Similar Complexes: Where *Narthecium ossifragum* increases to >10% cover and the *Sphagnum* cover decreases, the complex grades in to the sub-marginal Complex **9/7/6+P**. Where the *Sphagnum* cover increases, the complex grades in to the central Complex **15**. In addition to having a lower *Sphagnum* cover, Complex 9/7+P can be differentiated from Complex 15 in that the pools are usually smaller and are not interconnecting.

Annex habitats: As well as supporting the Priority Annex habitat Active Raised Bog (7110), this complex can support the Annex habitat "Depressions on peat substrates of the Rhynchosporion" (7150).

Complex 4+P

Microtopography: Low hummocks, lawns and interconnecting pools (>10% cover).

***Sphagnum* cover**: >40% (usually 60-70%)

Firmness: Soft to very soft

Characteristic species: *Rhynchospora alba* (>10%) and *Sphagnum cuspidatum* (>10% cover)

Description: This is a sub-central complex in which the bog surface is generally soft to very soft. The pools within this complex are large and sometimes interconnecting. Where western indicators are present consider the sub-central Complex **4/35**. *Rhynchospora alba* (>10%) is the most prominent species in the vegetation, sometimes having a cover of up to 25%. Pools are mostly filled with *Sphagnum cuspidatum*, but cover can vary in places. *Menyanthes trifoliata* and *Drosera anglica* are usually present. The *Sphagnum* layer is dominated by *S. papillosum*, *S. medium* and/or *S. cuspidatum,* though *S. rubellum and S. austinii* are usually also present. The cover of *Narthecium ossifragum* is usually very low (<5%) and it is sometimes absent. *Eriophorum vaginatum* (usually >10%) is also prominent**.**

Similar Complexes: Where the cover of *Narthecium ossifragum* is higher, consider Complex **6/4+P**. Where the cover of *Eriophorum vaginatum* is higher (>15%) and pools are relatively small in size (and not interconnecting), consider the Complex **9/7/4+P**. Where the *Sphagnum* cover decreases and the cover of *Narthecium ossifragum* or *Eriophorum* spp. increases, consider the sub-marginal Complexes **6+P** and **4/9+P**.

Annex habitats: As well as supporting the Priority Annex habitat Active Raised Bog (7110), this complex supports the Annex habitat "Depressions on peat substrates of the Rhynchosporion" (7150).

Complex 6/4+P

Microtopography: Hummocks, flats, hollows/depressions, lawns and pools (>10% cover).

***Sphagnum* cover**: >40% (usually higher, but can be lower on western sites)

Firmness: Soft to very soft (rarely quaking)

Characteristic species: *Narthecium ossifragum* (>15%) and *Rhynchospora alba* (>15%)

Description: This sub-central complex is usually found on western raised bog sites. The bog surface is very soft underfoot and there may be some quaking areas close to the pools. The pool cover is variable, ranging from between 10-30% cover.

Sphagnum cuspidatum is found in scattered patches of the pools (averaging at ca. 30-50% of each pool) with *S. papillosum* at the pool margins along with *Campylopus atrovirens*. Large patches of open water are also present with *Sphagnum auriculatum*, *Drosera anglica* and algae usually present. The overall *Sphagnum* cover is also variable, but averages at >40% with hummocks of *Sphagnum rubellum*, *S. papillosum, S. austinii* and occasionally *S. beothuk* found in the inter-pool areas. *Narthecium ossifragum* dominates flats and hollows occurring at 15-30% cover with *Rhynchospora alba* also characterising the complex, being found at 15-20% cover in depressions, lawns and at the edges of pools. *Carex panicea* is also usually present at 5-10% cover as well as *Eriophorum* spp. (averaging at 10% cover). On midland sites there is usually a higher *Sphagnum* cover (>50%) with *S. cuspidatum* generally >50% cover of each pool, and *Campylopus atrovirens* is absent.

Similar Complexes: Where pool and *Sphagnum* cover is lower, consider the sub-marginal Complex **6/4**. Where *Narthecium ossifragum* cover is higher and *Rhynchospora alba* and *Sphagnum* cover is lower, consider the sub-marginal Complex **6+P**.

Annex habitats: As well as supporting the Priority Annex habitat Active Raised Bog (7110), this complex supports the Annex habitat “Depressions on peat substrates of the Rhynchosporion” (7150).

Complex 6/9+P

Microtopography: Low hummocks, flats, hollows/depressions, lawns and pools (>10% cover).

***Sphagnum* cover**: >40% (usually higher, but can be lower on western sites)

Firmness: Soft to very soft

Characteristic species: *Narthecium ossifragum* (>15%) and *Eriophorum* spp. (>15%)

Description: This is a sub-central complex in which the bog surface is soft. Pools cover 10-20% of the surface area, and many have an algal covering with a patchy cover of *Sphagnum cuspidatum* (30-50% of each pool), though most have a high cover of *S. papillosum* and/or *S. medium* around their margins. *Drosera anglica*, *Rhynchospora alba* and *Eriophorum angustifolium* are also present in the pools. The overall *Sphagnum* cover is usually >40% composed mostly of hummocks of *S. papillosum* and *S. rubellum* with *S. austinii* also usually present. *Narthecium ossifragum* (averaging 20%) and *Eriophorum vaginatum* (15-20%) dominate the inter-pool vegetation, and the relative abundance and height of *Calluna vulgaris* can often be low (10-20% cover). Where the cover of pools increases and they are long and interconnecting and some western indicators are present, consider Complex **6/35**.

On midland sites there is usually a higher *Sphagnum* cover (>50%) with *S. cuspidatum* typically >50% cover of each pool; *Campylopus atrovirens* is normally absent. Sometimes this complex can indicate relatively recent burning.

Similar Complexes: Where pool and *Sphagnum* cover is lower, consider the sub-marginal Complex **6/9**. Where *Narthecium ossifragum* cover is higher and *Eriophorum* spp. and the *Sphagnum* cover is lower, consider the sub-marginal Complex **6+P** or **6/3+P** where there is an increased cover of *Carex panicea*.

Annex habitats: As well as supporting the Priority Annex habitat Active Raised Bog (7110), this complex can support the Annex habitat “Depressions on peat substrates of the Rhynchosporion” (7150).

Complex 3/9+P

Microtopography: Dominated by hummocks, flats and pools (>10%)

***Sphagnum* cover**: >40% (usually higher, but can be lower on western sites)

Firmness: Soft to very soft

Characteristic species: *Carex panicea* (>15%), *Eriophorum* spp. (>15%) and *Pleurozia purpurea* or *Campylopus atrovirens* usually present

Description: This is a sub-central complex that tends to occur on sites that have some western indicators present such as *Campylopus atrovirens* and *Pleurozia purpurea*. *Carex panicea* reaches high cover values (>15%) within the complex due to the western influence. The *Sphagnum* cover is >40% (and usually >50%), tending to be higher on the less western sites. *Eriophorum* spp. are also prominent, particularly *E. vaginatum*. *Menyanthes trifoliata* is usually present in the pools. The *Sphagnum* layer is dominated by *S. rubellum* and *S. papillosum* though *S. cuspidatum* and *S. medium* are also frequent, and *S. austinii* and *S. beothuk* are often present. The cover of *Narthecium ossifragum* and *Rhynchospora alba* is low (usually 5-10%). *Eriophorum angustifolium* is usually the more abundant *Eriophorum* spp. and the cover of *Cladonia portentosa* is usually high (>25%) with *C. uncialis* often present also.

Similar Complexes: Where the cover of *Narthecium ossifragum* increases and the *Sphagnum* cover decreases, consider the sub-marginal Complex **6/3+P**. Where western indicators are frequent and the pool cover is >20%, consider the sub-central Complex **3/35**.

Annex habitats: As well as supporting the Priority Annex habitat Active Raised Bog (7110), this complex can sometimes support the Annex habitat “Depressions on peat substrates of the Rhynchosporion” (7150).

Complex 6/35 (and 3/35, 4/35)

Microtopography: Hummocks, flats and large interconnecting pools (>20% cover).

***Sphagnum* cover**: >30% (but usually higher)

Firmness: Soft to very soft and rarely quaking

Characteristic species: *Narthecium ossifragum* (>20%), *Racomitrium lanuginosum* and *Campylopus atrovirens*

Description: This is a sub-central complex that is found on western raised bogs. The bog surface is usually soft though it can be very soft occasionally. It is similar to the central Complex 35, but *Sphagnum* cover is lower and *Narthecium ossifragum* flats are more common with *N. ossifragum* covering >20% of the surface area. Pools cover >20% of the surface area and have a patchy cover of *Sphagnum* (ca. 25% of each pool) including both *S. cuspidatum* and *S. auriculatum*. The pools are mostly filled with open water, though *Eriophorum angustifolium*, *Drosera anglica* and *Menyanthes trifoliata* are usually present as well as algae. *Sphagnum papillosum* is usually abundant at the pool margins with the western indicator *Campylopus atrovirens* also present. Island hummocks of *Racomitrium lanuginosum* are occasional. *Narthecium ossifragum* dominates the inter-pool areas along with *Rhynchospora alba* (10-20%), which occurs mostly at the pool margins. The overall *Sphagnum* cover within this complex is usually c. 40% with *S. papillosum*, the most abundant of the Sphagna. Hummocks of *S. rubellum* are frequent in the inter-pool areas and there is usually occasional *S. austinii* and *S. beothuk*. In the inter-pool

areas, there are no dominant higher plants other than *Narthecium ossifragum*, although patches of *Carex panicea* can be common.

Variants: Where the cover of *Carex panicea* increases to >20% the complex is termed **3/35**. Where the cover of *Rhynchospora alba* increases to >20% the complex is termed **4/35**.

Similar Complexes: Where *Narthecium ossifragum* cover is higher and *Sphagnum* cover is lower, consider the sub-marginal Complex **6+P**. Where the pool and *Sphagnum* cover is higher, consider the central Complex **35**.

Annex habitats: As well as supporting the Priority Annex habitat Active Raised Bog (7110), this complex, particularly the 4/35 variant usually supports the Annex habitat "Depressions on peat substrates of the Rhynchosporion" (7150).

Complex 10/9 (and 10/9a, 9/10)

Microtopography: In-filled hollows/lawns and hummocks with pools <10% or absent

***Sphagnum* cover**: >75% (**9/10** variant has a lower cover)

Firmness: Soft to very soft and sometimes quaking

Characteristic species: *Eriophorum* spp. (>15%) and *Sphagnum cuspidatum* (>10% cover and usually much higher)

Description: This is a wet sub-central complex, which shares many characteristics of a central complex ecotope. The surface, in general, is soft to very soft underfoot with occasional quaking areas. There is a very good *Sphagnum* cover (>75%) and the vegetation is dominated by lawns of *S. papillosum*, *S. medium* and *S. cuspidatum* along with frequent tufts of *Eriophorum vaginatum* (>15%) and *E. angustifolium*. These lawns are sometimes more like infilled depressions or pools. In general, the microtopography is poorly developed with the lawn or pool-like areas often forming large homogenous patches. Hummocks are usually occasional and low-growing and composed of *S. rubellum*, *S. medium* and *S. papillosum* (which grades into lawns) and very occasionally of *S. beothuk* and *S. austinii*. *Calluna vulgaris* (10%) is less frequent than in other complex types but is frequent on hummocks. *Rhynchospora alba* (10%) is scattered across the *Sphagnum* lawns, which are composed mostly of *S. cuspidatum* and *S. medium* and sometimes *S. papillosum*.

Variants: A variant of this complex occurs where *Eriophorum angustifolium* is more dominant and this is termed **10/9a**. The dominant Sphagna in **10/9a** is usually *S. medium*. Where conditions are slightly drier and the *Sphagnum* cover is lower (41-75%), another variant, the sub-central Complex **9/10** occurs. Hummocks are usually more common in this variant and *S. papillosum* is more abundant. Complex 10/9 and all its variants are often associated with areas re-wetting after restoration works.

Similar Complexes: The sub-central Complex 10/9 can be difficult to differentiate from the central Complex **10/15**. In 10/15, there is at least some variation in microtopography with hummocks being somewhat distinct from lawns and pools etc. whereas this distinction is not as clear in Complex 10/9. *Drosera anglica* and particularly *Menyanthes trifoliata* can be relatively frequent in 10/15 but are usually rare or absent in 10/9. Some taller hummocks of *Sphagnum austinii* and *S. beothuk* may also be present in 10/15 and hummocks in general usually account for >25% of cover while in 10/9 cover of hummocks is usually <25%. Complex 10/15 also tends to have at least some quaking element while 10/9 does not. *Eriophorum* spp. usually occur at >10% cover in both complexes but tend to be more abundant in 10/9 (usually being by the far the most dominant vascular plant), sometimes reaching cover values of >30%. Complex 9/10, on the other hand, is differentiated from

Complex **9/7/10** in having a lower cover of hummocks (usually <50%) compared to 9/7/10 (usually >50%). *Sphagnum* lawns are also usually a prominent feature of 9/10 and rare in 9/7/10. *S. cuspidatum* cover is also higher in 9/10 (usually >10%) than in 9/7/10 (usually <5%).

Annex habitats: As well as supporting the Priority Annex habitat Active Raised Bog (7110), this complex can support the Annex habitat “Depressions on peat substrates of the Rhynchosporion” (7150).

Complex 10/4 (and 4/10)

Microtopography: In-filled hollows/lawns and hummocks with pools <10% or absent

***Sphagnum* cover**: >75% (**4/10** variant has a lower cover)

Firmness: Soft to very soft and sometimes quaking

Characteristic species: *Rhynchospora alba* (>15%) and *Sphagnum cuspidatum* (>10% cover)

Description: This is a sub-central complex, in which the surface is usually very soft underfoot. Low hummocks and hollows are present and sometimes there are occasional pools (<10% cover). *Sphagnum* (>75%) dominates the vegetation occurring in low hummocks, lawns, in-filled hollows and pools along with *Rhynchospora alba* (>15%), which is found growing in pools, hollows and lawns. *Eriophorum angustifolium*, *Drosera anglica* and *Menyanthes trifoliata* are found occasionally. Hummocks of *S. rubellum* are frequent and hummocks of *S. austinii*, *S. subnitens* and *S. beothuk* are also usually present. *Calluna vulgaris* (10-20%) dominates in hummocks with *Eriophorum vaginatum* (5-20%) frequent in places. *Narthecium ossifragum* is present at low cover values in hollows (<10%).

Variants: Where conditions are slightly drier and the *Sphagnum* cover is lower (41-75%), variant Complex **4/10** occurs. Pools present in **4/10** often show signs of desiccation with algae frequent and the dominant ‘pool’ Sphagna often being *Sphagnum papillosum* and *S. medium* instead of *S. cuspidatum*.

Similar Complexes: Complex 10/4 can be difficult to differentiate from the central Complex **10/15**. In 10/15, there is greater variation in microtopography with hummocks being distinct from lawns and pools etc. Some taller hummocks of *Sphagnum austinii* and *S. beothuk* may also be present in 10/15 and 10/15 tends to have at least some quaking element while 10/4 does not. *Rhynchospora alba* tends to have a higher cover value in 10/4 (often >20%) than in 10/15 (usually 5-10%).

Where pools occur at a cover of >10%, consider the sub-central Complex **4+P** (where pools are interconnecting and there are open water areas) or Complex **9/7/4+P** (where pools are smaller and not interconnecting but have an excellent *Sphagnum* cover).

Complex 4/10, on the other hand, is differentiated from sub-marginal Complex **9/7/4** in having a higher *Sphagnum* cover. Algae and other indications of desiccation are also more common in Complex 9/7/4.

Annex habitats: As well as supporting the Priority Annex habitat Active Raised Bog (7110), this complex supports the Annex habitat “Depressions on peat substrates of the Rhynchosporion” (7150).

Complex 10/6 (and 6/10)

Microtopography: In-filled hollows/lawns and hummocks with pools <10% or absent

***Sphagnum* cover**: >75% (**6/10** variant has a lower cover)

Firmness: Soft to very soft

Characteristic species: *Narthecium ossifragum* (>15%) and *Sphagnum cuspidatum* (>10% cover)

Description: This is a sub-central complex, in which the surface is usually very soft underfoot. Low hummocks and hollows are present and sometimes there are occasional pools (<10% cover). *Sphagnum* (>75%) dominates the vegetation occurring in low hummocks, lawns, in-filled hollows and pools along with *Narthecium ossifragum* (>15%, usually >20%), which is found growing in pools, hollows and lawns. *Eriophorum angustifolium*, *Drosera anglica* and *Menyanthes trifoliata* are found occasionally. Hummocks of *S. rubellum* are frequent and hummocks of *S. austinii*, *S. subnitens* and *S. beothuk* are also usually present. *Calluna vulgaris* (10-20%) dominates in hummocks with *Eriophorum vaginatum* (5-20%) frequent in places. *Rhynchospora alba* is present at low cover values in hollows (<5%).

Variants: Where conditions are slightly drier and the *Sphagnum* cover is lower (41-75%), variant Complex **6/10** occurs. Any pools present in 6/10 usually show signs of desiccation with algae often frequent and the dominant 'pool' Sphagna being *Sphagnum papillosum* and/or *S. medium* instead of *S. cuspidatum*.

Similar Complexes: Where pools occur at a cover of >10%, the cover of *Narthecium* is >25%, the *Narthecium* hollows are largely devoid of *Sphagnum* and the overall cover of *Sphagnum* is c 40% or lower, consider the sub-marginal Complex **6+P**.

Annex habitats: As well as supporting the Priority Annex habitat Active Raised Bog (7110), this complex can support the Annex habitat "Depressions on peat substrates of the Rhynchosporion" (7150).

Complex 3/10 (and 10/3)

Microtopography: In-filled hollows/lawns, flat and hummocks with pools <10% or absent

***Sphagnum* cover**: >40% (**10/3** variant has a higher cover)

Firmness: Soft to very soft

Characteristic species: *Carex panicea* (>15%), *Cladonia portentosa* (>25%) and *Pleurozia pupurea* usually present

Description: This is a transitional sub-central/sub-marginal complex that has characteristics of each ecotope. It tends to occur on sites that have some western indicators present such as *Pleurozia purpurea*. *Carex panicea* reaches high cover values (>15%) within the complex due to the western influence, reaching cover values of 30% in the more western sites. The bog surface is soft underfoot and very soft in places. The *Sphagnum* cover is >40% (and usually >50%), tending to be higher on the less western sites. This is dominated by hummocks of *Sphagnum rubellum* with frequent lawns and low hummocks of *S. medium* and *S. papillosum* as well as occasional hummocks of *S. austinii* and *S. beothuk*. There are also usually patches of *S. cuspidatum* in in-filled hollows. *Calluna vulgaris* and *Eriophorum* spp. are the only other prominent vascular plants with *E. angustifolium* sometimes being particularly abundant. The cover of *Cladonia portentosa* is usually high (>25%) while the cover of *Rhynchospora alba* tends to be low (<5%).

Variants: Where the *Sphagnum* cover is >75%, the complex is distinguished as Complex **10/3**.

Similar Complexes: Where conditions are slightly drier and the *Sphagnum* cover is lower, consider the sub-marginal complex **9/7/3**. This is differentiated from 3/10 in having less *Sphagnum* in hollows or lawns and a thinner *Sphagnum* layer in

hummocks. Where the cover of pools is higher (>10%), consider the sub-central complex **3/9+P**.

Annex habitats: As well as supporting the Priority Annex habitat Active Raised Bog (7110), this complex can sometimes support the Annex habitat "Depressions on peat substrates of the Rhynchosporion" (7150).

Complex 9/7/10

Microtopography: Dominated by hummocks with occasional hollows. Pools very rare or absent.

***Sphagnum* cover**: >50% (usually higher)

Firmness: Soft to very soft (usually very soft)

Characteristic species: *Calluna vulgaris* (20-40%), *Eriophorum vaginatum* (>15%; generally >20%) and *Sphagnum rubellum* is the dominant *Sphagnum*.

Description: This is a transitional sub-central/sub-marginal complex that has characteristics of each ecotope. The complex usually grades into the sub-marginal Complex **9/7** and the differences between the two complexes are very subtle. The surface is usually soft to very soft underfoot. Hummocks dominate with occasional hollows and lawns, and pools are largely absent. Generally, however, the *Sphagnum* layer in the sub-central complex is thicker and has a slightly higher cover (>50%). *S. rubellum* is usually the dominant *Sphagnum* within this complex, but there is always at least some cover (>5% and usually >10%) of 'wetter' Sphagna, typically *S. medium*. There are also often very occasional hummocks of *S. austinii*. *Eriophorum vaginatum* (usually >20%) is also more abundant in the sub-central complex than in 9/7 and characterises the vegetation along with *Calluna vulgaris* (c. 30%) and little or no cover (<5%) of *Narthecium ossifragum*.

Similar Complexes: Where the cover of *Calluna vulgaris* increases (>50%) and that of *Eriophorum vaginatum* decreases (<15%), the cover of *Sphagnum* also usually decreases and the complex grades into the sub-marginal Complex **9/7**. Complex 9/7/10 is differentiated from the better quality Complex **9/10** in having a higher cover of hummocks (usually >50%) compared to 9/10 (usually <50%). *Sphagnum* lawns are also usually a prominent feature of 9/10 and rare in 9/7/10. *S. cuspidatum* cover is also higher in 9/10 (usually >10%) than in 9/7/10 (usually <5%).

Annex habitats: As well as supporting the Priority Annex habitat Active Raised Bog (7110), this complex can sometimes support the Annex habitat "Depressions on peat substrates of the Rhynchosporion" (7150).

Sub-marginal Ecotope Complexes

Complex 9/7/6+P (and 9/7/3+P, 9/7/2+P)

Microtopography: Hummocks, hollows, flats and pools (>10% cover).

***Sphagnum* cover**: 11-40% (usually c. 30-40%)

Firmness: Soft

Characteristic species: *Eriophorum* spp. (>10%); *Narthecium* dominated hollows (>10%; usually >20%).

Description: This is a sub-marginal complex that may have some characteristics of the sub-central Complex **9/7+P**. However, generally there is a lower cover of *Sphagnum* within 9/7/6+P and a higher cover of *Narthecium* dominated hollows. These *Narthecium* hollows can occur in 9/7+P but will be accompanied by a relatively

high *Sphagnum* cover while in 9/7/6+P, the hollows are largely devoid of *Sphagnum*. Pools in 9/7/6+P also differ from those in 9/7+P in that the cover of *Sphagnum* is patchier (usually <50% cover of pool) and algae is more common. Otherwise, species composition can be similar to the sub-central Complex **9/7+P**.

Variants: Two variants of this complex also occur. These tend to occur where hollows are less distinctive, and flats become more prominent. In these cases, *Narthecium ossifragum* usually becomes less abundant and is replaced by either *Carex panicea* (Complex **9/7/3+P**) and/or *Trichophorum germanicum* (Complex **9/7/2+P**).

Similar Complexes: Differentiated from the sub-central **Complex 9/7+P** in having a lower *Sphagnum* cover and a higher cover of *Narthecium ossifragum* and algae.

Annex habitats: None.

Complex 6+P (and 6/3+P)

Microtopography: Low hummocks, flats, hollows/depressions and pools (>10% cover).

***Sphagnum* cover**: 11-40% (usually c. 20-30%)

Firmness: Soft

Characteristic species: *Narthecium ossifragum* (>15%)

Description: This is a sub-marginal complex that may have some characteristics of the sub-central Complexes **6/9+P** and/or **6/35**. However, generally there is a lower cover of *Sphagnum* within 6+P. In Complex 6+P, *Narthecium* dominated areas can cover a large amount of the complex (usually >25%) and these areas are largely devoid of *Sphagnum*. Pools are usually less extensive than in 6/35 and support less *Sphagnum* than in 6/9+P. The cover of *Eriophorum vaginatum* is also usually low (<10%) in 6+P.

Variants: Where there is an increased cover of *Carex panicea*, the variant **6/3+P** occurs.

Similar Complexes: Differentiated from the sub-central **Complex 6/9+P** in having a lower *Sphagnum* cover and a higher cover of *Narthecium ossifragum*, *Carex panicea* and algae. Differentiated from the marginal **Complex 3/6+P** in having a higher *Sphagnum* cover, a higher cover of *Narthecium ossifragum* and a lower cover of *Carex panicea*. The ground also tends to be soft in 6/3+P while firm in 3/6+P.

Annex habitats: None.

Complex 9/7 (and 7/9)

Microtopography: Dominated by hummocks with occasional hollows. Pools absent.

***Sphagnum* cover**: 11-50% (usually c. 40%, but can be much lower in Complex 7/9)

Firmness: Soft to very soft (usually soft)

Characteristic species: *Calluna vulgaris* (>30% and usually >50%), *Eriophorum vaginatum* (>10%) and *Sphagnum rubellum* is the dominant *Sphagnum*.

Description: This is a sub-marginal complex that has many characteristics of and often grades into the sub-central Complex **9/7/10**. The differences between the two complexes are subtle and not easy to identify. However, in general the *Sphagnum* layer in the sub-marginal complex is thinner and reaches a slightly lower abundance cover averaging at ca. 40% but is sometimes higher. Although *Eriophorum vaginatum* (10-15%) characterises the vegetation along with *Calluna vulgaris* (>30%),

it is not as abundant as it is in the sub-central complex. Furthermore, the *Sphagnum* layer is dominated almost entirely by *S. rubellum* with occasional *S. tenellum* and *S. papillosum*.

Variants: Where the cover of *Calluna vulgaris* increases to >75%, conditions are generally drier and the complex is distinguished as Complex **7/9**. The growth of *Calluna* is usually more robust in these areas, often growing up to 0.7m and the cover of *Eriophorum vaginatum* is lower (5%). There is also an increased cover of *Hypnum jutlandicum* underneath the *Calluna*.

Similar Complexes: Complex 9/7 differs from **9/7/10** in that generally there is a lack of cover of any 'wetter' Sphagna with *S. medium* being particularly useful as a diagnostic species of 9/7/10. The quality of the complex generally degrades with an increase in cover of *Calluna vulgaris* and a decrease in cover of *Eriophorum vaginatum*. *Narthecium ossifragum* is absent or occurs at <5% cover. Where there is an increase in cover of *Narthecium ossifragum* (>5%), the complex grades in to the sub-marginal Complex **9/7/6**.

Annex habitats: None.

Complex 9/7/6 (and 9/7/4, 9/7/3, 9/7/2)

Microtopography: Dominated by hummocks and hollows. Pools largely absent.

***Sphagnum* cover**: 11-40% (usually c. 25-30%)

Firmness: Soft to very soft (usually soft)

Characteristic species: *Calluna vulgaris* (>25%), *Eriophorum vaginatum* (>10%) and *Narthecium ossifragum* (>10%).

Description: This is one of the most common complexes found on the high bog and is indicative of a slightly lowered water table. It is similar to Complex **9/7**, but with the addition of frequent *Narthecium* dominated hollows that cover at least 10% of the complex. These hollows can often cover up to 50% of the complex and generally have little or no *Sphagnum* cover.

Variants: Where the hollows are more like depressions and have a higher cover of *Rhynchospora alba* instead of *Narthecium ossifragum*, the variant **9/7/4** occurs. Note that in 9/7/4, the depressions still have little or a patchy cover of *Sphagnum*, and where the cover becomes moderate, consider the sub-central complexes **9/7/10** or **4/10.** Where the hollows are more like flats and have a higher cover of *Carex panicea* instead of *Narthecium ossifragum*, the variant **9/7/3** occurs, or where the flats support a high cover of *Trichophorum germanicum*, the variant **9/7/2** occurs.

Similar Complexes: Differentiated from Complex **9/7** in having a lower *Sphagnum* cover and a higher cover of hollows dominated by *Narthecium ossifragum*. Differentiated from the sub-central Complex **9/7/10** in that the hollows have little, or no *Sphagnum* cover and the overall *Sphagnum* cover is <40%, consider.

Annex habitats: None.

Complex 6/4

Microtopography: Dominated by low hummocks, hollows, flats and depressions that often appear to have been a former pool system. Pools and lawns largely absent.

***Sphagnum* cover**: 11-40% (usually c. 25-30%)

Firmness: Soft to Very soft

Characteristic species: *Rhynchospora alba* (≥15%) and *Narthecium ossifragum* (≥20%)

Description: This is a typical sub-marginal complex with *Sphagnum* cover usually c. 25-30%. *Rhynchospora alba* dominates in depressions, which appear to be dried out pool systems. These depressions have a patchy *Sphagnum* cover with occasional *S. medium* and *S. cuspidatum* (both usually <5%). *S. papillosum* and *S. rubellum* are the most abundant Sphagna. *Eriophorum* spp. can also be prominent, and *Narthecium* can have a large cover value (up to 40%). The relative abundance and height of *Calluna vulgaris* can often be low in this complex.

Similar Complexes: Where *Calluna vulgaris* is more of a feature and the cover of *Narthecium* decreases, consider the sub-marginal Complex **4/7**.

Annex habitats: None.

Complex 6/3 (and 6/3/9)

Microtopography: Dominated by low hummocks, hollows and flats. Lawns absent. Pools largely absent.

***Sphagnum* cover**: 11-40% (usually c. 20-25%)

Firmness: Soft

Characteristic species: *Carex panicea* (≥15%) and *Narthecium ossifragum* (≥20%)

Description: *Narthecium ossifragum* dominates in hollows and there are little or no deeper depressions or pools. *Carex panicea* (≥15%) dominates in flats and is often mixed in with the *Narthecium* hollows. *Sphagnum* cover is usually c. 20-25% and is generally composed of low hummocks of *Sphagnum rubellum*, *S. papillosum* and *S. tenellum*.

Variants: Where *Eriophorum* spp. are present at >10% cover, the surface can be softer and the cover of *Sphagnum* higher. This is considered a variant of 6/3 and is termed **6/3/9**.

Similar Complexes: Where this complex occurs with pools, consider the sub-marginal Complex **6/3+P**.

Where the cover of *Narthecium* decreases, that of *Carex panicea* can increase. In these areas the surface is often firmer, and the cover of *Sphagnum* lower. Consider the marginal Complex **3/6** where the *Sphagnum* cover is at or below 10% cover.

Annex habitats: None.

Complex 4/7

Microtopography: Dominated by hummocks and hollows. (Sometimes with features that appear to be degraded dried out former pools now dominated by *Rhynchospora* and/or algae)

***Sphagnum* cover**: 11-40% (usually c. 25%)

Firmness: Soft

Characteristic species: *Rhynchospora alba* (≥20%)

Description: This complex is characterised by a high cover of *Rhynchospora alba* (usually >20%). Ericaceous shrubs (*Calluna vulgaris* and *Erica tetralix*) are the only other vascular plants that occur at high covers (usually 30-50% combined with both plants close to equal cover values). The cover of *Eriophorum* spp., *Narthecium ossifragum* and any other vascular plants is usually <5%. There can be a diverse range of Sphagna present with small patches (<5%) of *S. medium* and *S. cuspidatum*

persisting in the wetter parts where the occasional pool can sometimes be found. However, *S. rubellum*, *S. papillosum* and *S. tenellum* are more abundant.

Similar Complexes: Where the cover of *Narthecium* increases and ericaceous shrubs are less prominent, consider the sub-marginal Complex **6/4**.

Annex habitats: None.

Complex 7/6 (and 7/6/4, 7/6/3)

Microtopography: Dominated by hummocks, flats and hollows.

***Sphagnum* cover**: 11-40% (usually c. 20%)

Firmness: Soft

Characteristic species: *Narthecium ossifragum* (≥20%) and *Calluna vulgaris* (>25%)

Description: This is a poor-quality sub-marginal complex (many characteristics of marginal ecotope) characterised by having a high cover of *Narthecium ossifragum* (usually >20%). Other than *Narthecium ossifragum* and *Calluna vulgaris*, no other vascular plants usually occur at a cover of >10% cover. *Sphagnum* cover is generally c. 20% and is dominated by *S. rubellum*.

Variants: A variant of this complex occurs where *Rhynchospora alba* is present at a cover of >10% (usually in depressions) and this is termed **7/6/4**. Another variant of this complex occurs where *Carex panicea* is present at a cover of >10% and this is termed **7/6/3**.

Similar Complexes: It can be difficult to distinguish Complex 7/6 from the marginal Complex **6/7**. Apart from there being a higher *Sphagnum* cover, the surface is usually softer underfoot, hummocks are more common and *Eriophorum* spp are more frequent (although they still usually occur at ≤5% cover). *Rhynchospora alba* is also usually present within Complex 7/6 (often >5% cover) while it can be largely absent (usually <5% cover) within 6/7.

Annex habitats: None.

Marginal Ecotope Complexes

Complex 3/6+P

Microtopography: Low hummocks, flats, hollows and pools (>10% cover).

***Sphagnum* cover**: c. 10%

Firmness: Firm

Characteristic species: *Carex panicea* (>15%) and *Narthecium ossifragum* (>15%)

Description: *Carex panicea* and *Narthecium ossifragum* are the most prominent vascular plants in this complex and there is usually a poorly developed microtopography with flats dominating. Pools are usually tear pools and while they may sometimes support a moderate *Sphagnum* cover, inter-pool areas are firm and almost devoid of *Sphagnum* (<10% cover). The cover of *Eriophorum vaginatum* is also usually low (<5%).

Similar Complexes: Differentiated from the sub-marginal **Complex 6/3+P** in having a lower *Sphagnum* cover, a lower cover of *Narthecium ossifragum* and a higher cover of *Carex panicea*. The ground also tends to be firm in 3/6+P while it is soft in 6/3+P. Where pools are less distinctive and there is an increased cover of *Rhynchospora alba*, consider Complex **3/6/4**.

Annex habitats: None.

Complex 6/7 (and 6/7/3, 6/7/2)

Microtopography: Hummocks, hollows and flats.

***Sphagnum* cover**: ≤10%

Firmness: Firm

Characteristic species: *Narthecium ossifragum* (≥20%) and *Calluna vulgaris* (≥20%)

Description: This marginal complex is characterised by having a high cover of *Narthecium ossifragum* (usually >20%). Other than *Narthecium ossifragum* and *Calluna vulgaris*, no other vascular plants usually occur at a cover of > 10% cover. *Sphagnum* cover is generally c. 10% and is dominated by *S. rubellum*. **Variants**: A variant of this complex occurs where *Carex panicea* is present at a cover of >10% and this is termed **6/7/3**. Another variant of this complex occurs where *Trichophorum germanicum* present at a cover of >10% and this is termed **6/7/2**. A third variant occurs where *Rhynchospora alba* is present at a cover of >10% (usually in depressions or erosion channels) and this is termed **6/7/4**.

Similar Complexes: It can be difficult to distinguish Complex 6/7 from the sub-marginal Complex **7/6**. Apart from there being a lower *Sphagnum* cover, the surface is usually firmer underfoot, flats are more dominant and *Eriophorum* spp are less frequent (largely absent or occurring at 1-3% cover). *Rhynchospora alba* is also usually present within Complex 7/6 (often >5% cover) while it can be largely absent (usually <5% cover) within 6/7 (except where there are scattered tear pools or erosion channels). The slope of the bog is also usually more pronounced in 6/7.

Annex habitats: None.

Complex 3/6 (and 3/6/2, 3/6/4, 3/6/7)

Microtopography: Hummocks, hollows and flats.

***Sphagnum* cover**: ≤10%

Firmness: Firm

Characteristic species: *Carex panicea* (>15%) and *Narthecium ossifragum* (>10%)

Description: Flats dominate usually at >30% cover (often >50%) with *Carex panicea* (>15% and usually >25% cover) dominating. *Narthecium ossifragum* (>10% cover) is also prominent. The *Sphagnum* cover is very poor (≤10%) and is composed almost entirely of *S. rubellum* and *S. tenellum*.

Variants: A variant of this complex occurs where *Rhynchospora alba* is present at a cover of >10% (usually in depressions or erosion channels) and this is termed **3/6/4**. This variant can sometimes support occasional tear pools and often occurs where there is at least a moderate slope. Another variant of this complex occurs where *Trichophorum germanicum* present at a cover of >10% and this is termed **3/6/2**. A third variant occurs where flats are less dominant (but still occur at c. 25% cover), and *Calluna vulgaris* is prominent (>25% cover), and this is termed **3/6/7**.

Similar Complexes: Where the cover of *Narthecium* increases, that of *Carex panicea* can decrease. In these areas the surface is often softer, and the cover of *Sphagnum* higher. Consider the sub-marginal Complex **6/3** where the *Sphagnum* cover is above 10% cover.

Annex habitats: None.

Complex 2/7 (and 2/3, 2/4)

Microtopography: Hummocks, tussocks and flats.

***Sphagnum* cover**: ≤10%

Firmness: Firm

Characteristic species: *Trichophorum germanicum* (≥10%)

Description: This marginal complex is typically found close to the high bog margin where there is a moderate to steep slope. The *Sphagnum* cover is very poor (≤10%) and is composed almost entirely of *S. rubellum* and *S. tenellum*. *Calluna vulgaris* can occur at high cover values (usually >50%).

Variants: A variant of this complex occurs where *Calluna* is less dominant and *Rhynchospora alba* is present at a cover of >10% (usually in depressions or erosion channels) and this is termed Complex **2/4**. Another variant of this complex occurs where *Calluna* is less dominant and *Carex panicea* occurs at a cover of >10% and this is termed **2/3**.

Annex habitats: None.

Facebank Ecotope Complexes

Complex 1

Microtopography:

***Sphagnum* cover**: ≤10%

Firmness: Firm

Characteristic species: *Robust Calluna vulgaris* (>90%)

Description: This complex usually occurs at the high bog margin and is characterised by the dominance of a robust growth of *Calluna vulgaris* (>90% cover and >0.75m in height). *Sphagnum* cover is poor and usually no other vascular plants are prominent. Cracks in the bog surface are often frequent.

Annex habitats: None.

Appendix 5 Ecotope surveys undertaken 2019-24

List of 64 sites where an ecotope survey was undertaken during the reporting period and whether a Conservation Condition Assessment (CCA) was also carried out or not. The 64 sites were in the following designation categories: Thirty bogs in 21 different SACs, 13 bogs in 13 separate NHAs, three bogs in one proposed SAC, nine bogs in five separate proposed NHAs and nine bogs in six separate non-designated sites.

Site Code	Site Name	Bog Name	Survey year	ARB (ha)	Project	CCA
002342	Mount Hevey Bog SAC	Mount Hevey Bog	2020	9.5	BnM	Yes
002341	Ardagullion Bog SAC	Ardagullion Bog	2020	9.2	LB	Yes
001242	Carrownagappul Bog SAC	Carrownagappul Bog	2021	45.3	LB	Yes
000575	Ferbane Bog SAC	Ferbane Bog	2021	36.9	LB	Yes
000679	Garriskil Bog SAC	Garriskil Bog	2021	68.9	LB	Yes
000581	Moyclare Bog SAC	Moyclare Bog	2021	23.2	LB	Yes
002346	Brown Bog SAC	Brown Bog	2022	7.4	MARBMP	Yes
000497	Flughany Bog SAC	Flughany Bog	2022	18.7	MARBMP	Yes
000580	Mongan Bog SAC	Mongan Bog	2022	48.3	MARBMP	Yes
000422	Aghnamona Bog NHA	Aghnamona Bog	2023	17.1	MARBMP	Yes
001227	Aughrim Bog NHA	Aughrim Bog	2023	10.4	MARBMP	Yes
000235	Bracklagh Bog NHA	Bracklagh Bog	2023	2.5	MARBMP	Yes
000595	Callow Bog SAC	Callow Bog	2023	11.4	MARBMP	Yes
001405	Cashel Bog (Leitrim) NHA	Cashel Bog	2023	6.3	MARBMP	Yes
000572	Clara Bog SAC	Clara Bog	2023	97.3	MARBMP	Yes
000677	Cloncrow Bog (New Forest) NHA	Cloncrow Bog	2023	6.9	MARBMP	Yes
000565	Clonydonnin Bog NHA	Clonydonnin Bog	2023	4.4	MARBMP	Yes
000600	Cloonchambers Bog SAC	Cloonchambers Bog	2023	8.4	MARBMP	Yes
002110	Corliskea/Trien/Cloonfelliv Bog SAC	Corliskea Bog	2023	45.0	MARBMP	Yes
002110	Corliskea/Trien/Cloonfelliv Bog SAC	Cloonfelliv Bog	2023	2.8	MARBMP	Yes
002110	Corliskea/Trien/Cloonfelliv Bog SAC	Trien Bog	2023	24.6	MARBMP	Yes
002033	Daingean Bog NHA	Daingean Bog	2023	0.8	MARBMP	Yes
000604	Derrinea Bog SAC	Derrinea Bog	2023	16.4	MARBMP	Yes
000873	XX proposed NHA	XX Bog	2023	4.7	MARBMP	Yes
000873	XX proposed NHA	XX Bog	2023	2.6	MARBMP	Yes
000873	XX proposed NHA	XX Bog	2023	2.0	MARBMP	Yes
001580	Girley Bog NHA	Girley Bog	2023	3.2	MARBMP	Yes
000297 000307	Lough Corrib SAC/Lough Tee Bog NHA	Lough Tee Bog East	2023	3.0	MARBMP	Yes

Site Code	Site Name	Bog Name	Survey year	ARB (ha)	Project	CCA
000221	Moorfield Bog/Farm Cottage NHA	Moorfield Bog/Farm Cottage Bog	2023	8.6	MARBMP	Yes
000582	Raheenmore Bog SAC	Raheenmore Bog	2023	46.8	MARBMP	Yes
002298	River Moy SAC	Kilgarriff Bog	2023	2.5	MARBMP	Yes
002298	River Moy SAC	Gowlaun Bog	2023	6.5	MARBMP	Yes
002298	River Moy SAC	Tawnaghbeg Bog	2023	10.3	MARBMP	Yes
002298	River Moy SAC	Derrynabrock Bog	2023	7.7	MARBMP	Yes
002298	River Moy SAC	Cloongoonagh Bog	2023	15.6	MARBMP	Yes
000326	Shankill West Bog SAC	Shankill West Bog	2023	15.3	MARBMP	Yes
000937	Scohaboy Bog NHA	Scohaboy Bog	2024	8.8	MARBMP	Yes
000564	River Little Brosna Callows NHA	Annagh Bog	2024	0.0	EMP	Yes
000641	Ballyduff/Clonfinane Bog SAC	Ballyduff Bog	2024	18.0	EMP	Yes
000641	Ballyduff/Clonfinane Bog SAC	Clonfinane Bog	2024	3.8	EMP	Yes
000647	Kilcarren-Firville Bog SAC	Kilcarren Bog	2024	10.7	EMP	Yes
000647	Kilcarren-Firville Bog SAC	Firville Bog	2024	14.6	EMP	Yes
001812	Lough Garr NHA	Lough Garr Bog	2024	3.3	EMP	Yes
000216 002138	River Shannon Callows SAC/XX proposed NHA	XX Bog	2024	0.8	EMP	Yes
002348	Clooneen Bog SAC	Clooneen Bog	2024	2.4	EMP	Yes
002349	Corbo Bog SAC	Corbo Bog	2024	17.7	EMP	Yes
000736	XX proposed NHA	XX Bog	2020	13.8	ABP	No
000763	XX proposed NHA	XX Bog	2022	0.9	BnM	No
000763	XX proposed NHA	XX Bog	2022	0.6	BnM	No
000763	XX proposed NHA	XX Bog	2022	2.1	BnM	No
000895	XX proposed NHA	XX Bog	2022	4.5	PCAS	No
N/A	Clynan	Clynan East Bog	2023	0.0	PCAS	No
N/A	Lisclogher	Lisclogher West Bog	2023	0.4	PCAS	No
N/A	Mostrim	Mostrim Bog	2023	12.9	PCAS	No
N/A	Tirur-Derrymore Bog Cluster	Islands Bog West	2024	6.6	PCAS	No
N/A	Tirur-Derrymore Bog Cluster	Cloonfaris Killosolan Bog	2024	1.3	PCAS	No
N/A	Tirur-Derrymore Bog Cluster	Cloonabricka Corrabaun Bog	2024	0.1	PCAS	No
N/A	Tirur-Derrymore Bog Cluster	Cloonnabricka Bog	2024	0.2	PCAS	No
002191	XX proposed SAC	XX Bog	2024	82.8	PCAS	No
002191	XX proposed SAC	XX Bog	2024	13.0	PCAS	No
002191	XX proposed SAC	XX Bog	2024	23.8	PCAS	No
N/A	Cloonboley Bog Complex	Tonalig Bog	2024	4.2	PCAS	No
N/A	Cloonbar Bog	Cloonbar Bog	2024	5.8	FKW	No

Site Code	Site Name	Bog Name	Survey year	ARB (ha)	Project	CCA
002356	Ardgraigue Bog SAC	Ardgraigue Bog	2024	20.4	NRP	No

Appendix 6 Walkover surveys undertaken 2019-24

Walkover surveys were undertaken on high bog in the following sites, all of which are non-designated, during the reporting period. No ecotope survey was carried out, but an estimate of the amount of ARB present is provided. All sites except for Cloonbar Bog were surveyed by Wetland Surveys Ireland as part of a programme of County Wetland Surveys (Crushell *et al*., 2021, 2022, 2023, 2024c; Foss *et al*., 2020). Cloonbar Bog was surveyed by Smith (2024).

County	Bog Name	Survey year	ARB (ha)	Comment
Cavan	Drumhawragh Ballytrust Bog	2024	0.0	No ARB present but walkover survey suggested DRB may be present.
Cavan	Carrigan Aghawelly Lower	2024	0.0	No ARB present and walkover survey suggested DRB unlikely.
Kilkenny	Rathpatrick Bruckanna Bog	2020	0.25	Interesting flush complex recorded with *Betula* & understory of *Polytrichum commune* and *Vaccinium oxycoccus* with good *Sphagnum* cover corresponding to ARB elsewhere. *Cladium mariscus* recorded growing amongst the fen/flush vegetation on high bog (possibly within a former drain). Walkover survey in 2020 did not estimate extent of ARB. Given the standard 0.25ha estimation in 2025 assessment.
Leitrim	Rossbeg Tooman Bog	2021	1.0	Small areas of ARB considered likely to be present towards the centre of the bog.
Tipperary	Derryvella Bog	2023	3.5	ARB recorded on site in 2023. ARB losses in reporting period due to turf cutting likely but unknown.
Tipperary	Woodville Bog	2022	1.0	ARB recorded on site in 2023. Restoration potential may be high (needs to be modeled) as intense series of large drains in the north of the site in an area that was commercially cut. Also some interesting species recorded on trackway in south of bog including Marsh Fritillary and Autumn Gentian.

Appendix 7 Sites assessed with aerial imagery

The following sites were assessed using aerial imagery (Bluesky and World imagery), which ranged in years from 2019 to 2022. All designated sites not surveyed since before 2010 were assessed in this way as well as all proposed NHAs, all NHAs proposed to be de-designated and a number of non-designated sites. Estimated area of ARB given in hectares. Cutting intensity (CI) was ranked as follows: Estimated number of plots cut since 2020: 0 = Absent (Abs); 1-5 = Very Low (VL); 6-14: Low (L); 15-29: Moderate (M); 30-49: High (H); ≥50: Very High (VH). Designation Status follows that proposed from the NHA review (NPWS, 2014).

List of designated sites (SACs and NHAs proposed for retention) assessed by a review of aerial imagery

Site Code	Bog Name	Most recent survey year	2024 ARB (ha)	CI	Comment
002339	Ballynamona Bog and Corkip Lough SAC	1999	11.5	VL	Unknown changes. Loss of ARB likely due to impacting activities. A review of the Derwin and MacGowan (2000) survey by the NPWS estimated that there was 12.1ha of ARB on the site (NPWS, 2016). Estimated loss of c. 5% the 2019-24 reporting period.
000231	Barroughter Bog SAC	2004	2.0	H	Unknown changes. Loss of ARB likely due to impacting activities. Estimate that c. 10% loss of ARB from 2004-2018 and an additional c. 5% from 2019-24.
000248	Cloonmoylan Bog SAC	2004	44.8	L	Unknown changes. Loss of ARB likely due to impacting activities. Estimate that c. 10% loss of ARB from 2004-2018 and an additional c. 5% from 2019-24.
000440	Clooncraff and Cloonlarge Bogs (Lough Ree SAC)	2003	5.0	VL	Unknown changes. Loss of ARB likely due to impacting activities. Estimate that c. 10% loss of ARB from 2003-2018 and an additional c. 5% from 2019-24.
002331	Mouds Bog SAC	2000	42.8	H	Note that NPWS reviewed the original survey and estimated that 47.48ha present in 2014. Unknown changes. Loss of ARB likely due to impacting activities. Estimate that c. 5% loss of ARB from 2014-2018 and an additional c. 5% from 2019-24.
002354	Tullaghanrock Bog SAC	2000	11.0	Abs	Unknown changes. Analysis of aerial photos suggests that ARB likely stable.
002343	Tullaher Lough and Bog SAC	1999	6.1	Abs	Unknown changes. Loss of ARB likely due to impacting activities. Estimate that c. 10% loss of ARB from 2000-2018 and none from 2019-24.

Site Code	Bog Name	Most recent survey year	2024 ARB (ha)	CI	Comment
000301	Lough Lurgeen Bog/Glenamaddy Turlough SAC	1994	16.3	VL	Unknown changes. Analysis of aerial photos suggests that ARB likely stable.
002338	Drumalough Bog West (part of Drumalough Bog SAC)	2003	4.6	Abs	Unknown changes. Loss of ARB likely due to impacting activities. Estimate that c. 10% loss of ARB from 2003-2018 and none from 2019-24.
000859	Derry Bog (part of Clonaslee Eskers and Derry Bog SAC but ARB not a QI)	2006	2.1	M	Unknown changes but decreases likely. Bog is relatively narrow (c. 460m wide) with cutting occurring along all of the northern margin. much of the eastern and some of the western margin, Some impacts on ARB likely since 2006 survey. Estimate that c. 10% loss of ARB from 2006-2018 and an additional c. 5% from 2019-24.
002355	Hawkswood Bog NHA	2010	3.5	Abs	Unknown changes. Decreases possible. Turf cutting continued up until c. 2020. However, ARB not mapped on site so difficult to assess whether losses occurred or not.
001388	Carbury Bog NHA	2003	0	VL	No ARB recorded on site, but DRB model in 2014 suggests that 4.1ha of DRB present at that time. This may have been impacted by the drains inserted in the north of the site and the cutting at the north of the site.

List of proposed NHAs assessed by a review of aerial imagery

Site Code	Most recent survey year	ARB (ha)	CI	Comment
000967	2016	0.3	Abs	Unknown changes.
000953	2013	0.3	Abs	Appears stable.
002190	2013	0.0	Abs	No ARB recorded on site, but DRB model in 2014 suggests that 8.4ha of DRB present at that time.
000908	2013	1.5	VL	Unknown changes. Turf cutting along mid-northern margin may be impacting ARB.
000960	2013	7.5	L	Unknown changes. Agricultural reclamation in the south-east of the site.
000877	2013	0.0	Abs	No ARB recorded and <1.0ha of DRB predicted.
000751	2013	8.0	VL	Unknown changes.
000768	2013	20.0	L	Unknown changes.
000834	2013	2.4	VL	Unknown changes.
000955	2013	3.0	Abs	Unknown changes.
000771	2013	0.1	Abs	Unknown changes.
000946	2013	0.0	Abs	Unknown changes.

Site Code	Most recent survey year	ARB (ha)	CI	Comment
000866	2013	4.5	L	Unknown changes. Cutting intensity on western lobe high and likely impacting on ARB. Estimated c. 10% loss of ARB. Note that this lobe is outside of the proposed boundary but was included in the assessment of the extent of ARB.
000944	2013	3.5	VL	Unknown changes.
000870	2013	8.0	VL	Cutting may be impacting on ARB, particularly the plot in the mid-west of the site, which is c. 50-100m from ARB.
000783	2013	3.5	M	Possible decreases. Cutting intensity in SE is high (with recent HB drainage inserted) and likely impacting on ARB. Estimated c. 10% loss of ARB.
002174	2013	7.0	Abs	Unknown changes.
000880	2013	0.0	Abs	No ARB recorded on site.
000820	2010	0	Abs	No ARB recorded on site.
000841	2010	0	H	No ARB recorded on site.

List of NHAs proposed to be de-designated assessed by a review of aerial imagery

Site Code	Bog Name	Most recent survey year	ARB (ha)	CI	Comment
000220	Lough Namucka Bog	2003	1.0	H	No ARB recorded on site but from visual assessment of aerials, the southern and eastern lobes look to support small areas of ARB (c. 1.0 ha in total). DRB model in 2014 suggests that 8.5ha of DRB present at that time. Turf cutting within 50m of area of likely ARB in the eastern lobe and thus declines in the extent of ARB likely. 10% decrease estimated over the reporting period.
000222	Ballyforan Bog (part of Suck River Callows)	2003	0	M	No ARB recorded on site, but DRB model in 2014 suggests that 1.9ha of DRB present at that time.
000245	Clooncullaun Bog	2003	2.0	M	Decreases in ARB likely. Turf cutting is taking place c. 100m from ARB mapped in 2003 in the north-east. Fernandez & Eakin (in prep.) estimated losses of 20% from 2003-18. A further 10% loss of ARB is estimated from 2019-24.
000247	Slieve Bog	2000	0	VH	No ARB recorded on site, but DRB model in 2014 suggests that 9.0ha of DRB present at that time.
000249	Cloonoolish Bog	2003	1.0	M	Decrease in ARB likely. Drains inserted on the high bog and cutting ongoing. Impacts on extent of ARB thus likely. Fernandez & Eakin (in prep.) estimated losses of 20% from 2003-18. A further 10% loss of ARB is estimated from 2019-24. Note that analysis of the aerials also indicates that ARB may have been

Site Code	Bog Name	Most recent survey year	ARB (ha)	CI	Comment
					underestimated during the 2003 survey. Potentially up to 4.0ha were present at the time of the 2003 survey.
000254	Crit Island Bog	2003	7.0	VH	Decrease in ARB likely (visual assessment of aerials). Turf cutting ongoing and within 70m of ARB in places. Impacts on extent of ARB thus likely. Fernandez & Eakin (in prep.) estimated losses of 20% from 2003-18. A further c. 5-10% loss of ARB is estimated to have occurred from 2019-24.
000267	Funshin Bog	2003	0	M	No ARB recorded on site, but DRB model in 2014 suggests that 3.1ha of DRB present at that time.
000280	Castle Ffrench West Bog (part of)	2003	0	H	No ARB recorded on site, and no DRB modeled on site.
000281	Keeloges Bog (East part)	2003	0	VL	No ARB recorded on site, but DRB model in 2014 suggests that 2.98ha of DRB present at that time.
000283	Kilmore Bog	2013	2.1	VH	Unknown changes. Turf cutting ongoing at a very high intensity so ARB losses possible. No ecotope map available from 2014 survey so difficult to assess whether recent cutting is likely to have impacted on ARB.
000284	Kilnaborris Bog	2013	1.0	H	Unknown changes as same dataset as per 2018. Turf cutting ongoing at a high intensity so ARB losses possible. No ecotope map available from 2014 survey so difficult to assess whether recent cutting is likely to have impacted on ARB.
000292	Leaha Bog	2003	0	L	No ARB recorded on site, but DRB model in 2014 suggests that 0.4ha of DRB present at that time.
000307	Lough Tee Bog (West part)	2003	1.5	M	Losses of ARB between 2003 and 2021 likely. Estimate that c. 10% loss of ARB from 2003-2018 and an additional c. 5% from 2019-24.
000310	Meeneen Bog	2003	0.9	VH	Decrease in ARB likely (visual assessment of aerials). Turf cutting ongoing (intensity very high) and within 10m of ARB in places. Impacts on extent of ARB thus likely. Fernandez & Eakin (in prep.) estimated losses of 20% from 2003-18. A further c. 10% loss of ARB is estimated to have occurred from 2019-24.
000337	Doon Lough Bog	2003	0	L	No ARB recorded on site and no DRB expected according to DRB model in 2014.
000564	River Little Brosna	2003	7.0	VH	Decrease in ARB likely. Turf cutting ongoing (intensity very high) and within

Site Code	Bog Name	Most recent survey year	ARB (ha)	CI	Comment
	Callows (Cloghan Demesne, Coolross West, Coolross/Ballyoughter/Clongowna Bogs)				20m of ARB in places. Impacts on extent of ARB thus likely. Fernandez & Eakin (in prep.) estimated losses of 20% from 2003-18. A further c. 5-10% loss of ARB is estimated to have occurred from 2019-24.
000570	Black Castle Bog	2003	5.0	VH	Losses in ARB likely (from visual assessment of aerial photos). Turf cutting in the north-east now extends beyond the extent of ARB mapped in that area in 2003. Fernandez & Eakin (in prep.) estimated losses of 20% from 2003-18. A further c. 15-20% loss of ARB is estimated to have occurred from 2019-24.
000591	Bella Bridge Bog	2003	0	L	No ARB recorded on site, but DRB model in 2014 suggests that 4.6ha of DRB present at that time.
000603	Cornaveagh Bog	2003	1.4	M	Decrease in ARB possible. Turf cutting ongoing (intensity moderate) and within 100m of ARB in places. Fernandez & Eakin (in prep.) estimated losses of 20% from 2003-18. A further c. 5-10% loss of ARB is estimated to have occurred from 2019-24. Note that analysis of the aerials also indicates that ARB may have been underestimated during the 2003 survey. Potentially up to 4.0ha were present at the time of the 2003 survey.
000605	Derrycanan Bog	2000	1.6	VH	Decrease in ARB likely. In the north-east of the site, turf cutting has extended 10m beyond what was mapped as ARB in 2000. Impacts on extent of ARB likely due to the ongoing high intensity of turf cutting. Fernandez & Eakin (in prep.) estimated losses of 20% from 2003-18. A further c. 20% loss of ARB is estimated to have occurred from 2019-24.
000648	Killeen Bog	2013	0.85	H	Unknown changes. Turf cutting ongoing at a high intensity so ARB losses possible. However, Bluesky imagery of 2022 suggests that the ARB may have been underestimated on this site? Appears to be an area of ARB in the north of the site. No ecotope map available from 2014 survey so difficult to assess whether recent cutting is likely to have impacted on ARB.
000674	Ballinderry Bog (part of Ballynagrenia /Ballinderry)	2000	2.0	VH	Decrease in ARB highly likely. In the east of the site, cutting has extended 40m beyond what was mapped as ARB in 2000. Impacts on extent of ARB estimated in 2018 highly likely due to the

Site Code	Bog Name	Most recent survey year	ARB (ha)	CI	Comment
					ongoing high intensity of turf cutting and high bog drainage with substantial high bog drainage inserted on the site in the early 2020s going through areas mapped as ARB in 2000. Fernandez & Eakin (in prep.) estimated losses of 20% from 2003-18. A further c. 50% loss of ARB is estimated to have occurred from 2019-24.
000691	Annaghcooleen Bog (part of Rinn River)	2003	8.2	VH	Decrease in ARB likely (visual assessment of aerials). In the west of the site, turf cutting has extended into what was mapped as ARB in 2003 while in the north-east cutting is now within 30m of what was mapped as ARB. In the south-west, high bog drains have been inserted in the and run through the area mapped as ARB. Thus, impacts on extent of ARB likely due to the ongoing high intensity of turf cutting and drainage. Fernandez & Eakin (in prep.) estimated losses of 20% from 2003-18. A further c. 20% loss of ARB is estimated to have occurred from 2019-24.
000921	Screggan Bog	2003	0.8	VH	Decrease in ARB likely (visual assessment of aerials). In the north-west of the site, turf cutting has extended 10m beyond what was mapped as ARB in 2003. Impacts on extent of ARB likely due to the ongoing high intensity of turf cutting. Fernandez & Eakin (in prep.) estimated losses of 20% from 2003-18. A further c. 20% loss of ARB is estimated to have occurred from 2019-24.
001240	Capira/Derrew Bog	2003	0	H	No ARB recorded on site, but DRB model in 2014 suggests that 0.1ha of DRB present at that time.
001255	Derrynagran Bog	2003	0	L	No ARB recorded on site, but DRB model in 2014 suggests that 2.0ha of DRB present at that time.
001264	Eskerboy Bog	2000	0	M	No ARB recorded on site, but DRB model in 2014 suggests that 10.2ha of DRB present at that time.
001280	Killaclogher Bog	2003	2	VH	No ARB recorded on site but from visual assessment of aerials, the southern lobe looks to support ARB of c. 2.0 ha in extent. DRB model in 2014 suggests that 5.8ha of DRB present at that time.
001283	Killure Bog	2003	2.1	VH	Unknown changes. Turf cutting taking place >700m from the mapped ARB. Fernandez & Eakin (in prep.) estimated losses of 20% from 2003-18. A further c. 20% loss of ARB is estimated to have occurred from 2019-24. However, patterning on aerials indicates that there

Site Code	Bog Name	Most recent survey year	ARB (ha)	CI	Comment
					may be unmapped ARB on south-east lobe close to the active turf cutting.
001303	Moorfield Bog	2003	1.0	M	Unknown changes. Turf cutting taking place c. 170m from the mapped ARB so impacts possible. Fernandez & Eakin (in prep.) estimated losses of 20% from 2003-18. A further c. 10% loss of ARB is estimated to have occurred from 2019-24.
001324	Jamestown Bog	2003	5.4	VH	Decrease in ARB likely. Cutting has occurred all around the perimeter and is now encroaching on what was mapped as ARB in 2003. Impacts on extent of ARB likely due to the ongoing high intensity of turf cutting. Fernandez & Eakin (in prep.) estimated losses of 20% from 2003-18. A further c. 20% loss of ARB is estimated to have occurred from 2019-24.
001352	Bunnaruddee Bog	2003	0	H	No ARB recorded on site, but DRB model in 2014 suggests that 1.1ha of DRB present at that time.
001393	Hodgestown Bog	2003	0	H	No ARB recorded on site, but DRB model in 2014 suggests that 1.16ha of DRB present at that time. DRB potential may have been impacted by the continued relatively high intensity of turf cutting at the site.
001420	Corracramph Bog	2003	1.7	L	Most of the cutting is taking place relatively far from the ARB but some impacts possible (visual assessment of aerials) as five plots in the south-east within 200m of ARB, but separated from it by a bog track. Furthermore cutting that appears to have been abandoned in the mid 2000s is within 25m of ARB mapped in 2003. Fernandez & Eakin (in prep.) estimated losses of 20% from 2003-18. ARB estimated to have remained stable since.
001423	Cloonageeher Bog	2003	4.8	H	Most of the cutting is taking place relatively far from the ARB but some impacts possible (from visual assessment of aerial photos) as two plots in the mid-west within 80m of the ARB mapped in 2003 and three plots in the north within 200m of the ARB mapped in 2003. Fernandez & Eakin (in prep.) estimated losses of 20% from 2003-18. ARB estimated to have remained stable since.
001448	Forthill Bog	2003	0.8	H	Possible decreases (from visual assessment of aerial photos). Most of the cutting is taking place relatively far from the ARB but some impacts possible as one plot in the south-east within 70m of ARB mapped in 2003 and

Site Code	Bog Name	Most recent survey year	ARB (ha)	CI	Comment
					two plots in the mid-east within 120m of ARB mapped in 2003. Fernandez & Eakin (in prep.) estimated losses of 20% from 2003-18. A further c. 10% loss of ARB is estimated to have occurred from 2019-24.
001582	Molerick Bog	2003	0	H	No ARB recorded on site, and no DRB modeled on site.
001623	Carrickynaghtan Bog (part of)	2003	0.2	VL	Unknown changes. Likely stable
001652	Tullaghan Bog (Roscommon)	2003	0	L	No ARB recorded on site, and no DRB modeled on site.
001684	Lorrha Bog	2003	0	M	No ARB recorded on site, but DRB model in 2014 suggests that 0.1ha of DRB present at that time.
001725	Nure Bog	2003	0	VH	No ARB recorded on site, but DRB model in 2014 suggests that 2.5ha of DRB present at that time.
001853	Timoney Bog (part of Nore Valley Bogs)	2013	4.2	VL	Unknown changes. No ecotope map available from 2014 survey so difficult to assess whether recent cutting is likely to have impacted on ARB.
001853	Cappalahan Bog (Nore Valley Bogs)	2000	2.0	L	ARB likely stable. Cutting is taking place at the other end of the site (c. 400m from the ARB mapped in 2000). However, it may be impacting on DRB. Fernandez & Eakin (in prep.) estimated losses of 20% from 2003-18. ARB estimated to have remained stable since.
002072	Lisnanarriagh Bog	2003	0	M	No ARB recorded on site, and no DRB modeled on site.
002307	Cloonloum More Bog	2000	0	VL	No ARB recorded on site, but DRB model in 2014 suggests that 2.4ha of DRB present at that time.
002344	Annaghbeg Bog	2013	7	M	Unknown changes as same dataset as per 2018. Turf cutting ongoing at a moderate to high intensity so ARB losses possible. No ecotope map available from 2014 survey so difficult to assess whether recent cutting is likely to have impacted on ARB.
002357	Clonreher Bog	2003	0	Abs	No ARB recorded on site, but DRB model in 2014 suggests that 1.1ha of DRB present at that time.

List of non-designated sites assessed by a review of aerial imagery

County	Bog Name	Most recent survey year	ARB (ha)	CI	Comment
Laois	Cullaun Bog	2013	2.7	M	Impacts on ARB likely (from analysis of aerial imagery) as cutting intensity moderate to high and bog is small. No map of ARB available but cutting likely to be within 100m of the ARB recorded in 2014. Estimate 10% loss of ARB since last surveyed.
Galway	Ussey Bog	2013	4.5	VL	Impacts on ARB likely (from analysis of aerial imagery) as cutting intensity moderate to high and bog is small. No map of ARB available but cutting likely to be within 100m of the ARB recorded in 2014. Estimate 10% loss of ARB since last surveyed.
Sligo	Cuilmore Bog	2011	2.0	L	Unknown changes - ARB likely stable. Most cutting appears to be on separate lobe of high bog to the ARB.
Westmeath	Kilbrennan (Gaybrook) Bog	2013	2.0	VL	Unknown changes - ARB likely stable. Very limited cutting on site and restricted to the SW margin, and over c. 500m from ARB.
Roscommon	Rooskagh Bog	2013	1.9	M	Unknown changes. Loss in ARB possible. Turf cutting likely within 100m of ARB. Estimate 5% loss from 2019-24.
Offaly/ Kildare	Clonroosk Little Bog	2013	2.0	L	A series of industrial scale drains were inserted on the high bog in 2014 but blocked soon after. These drains are likely to have had impact on the extent of ARB on the site by 2018.
Roscommon	Castlesampson Bog	2013	3.0	H	Impacts on ARB likely as cutting intensity high and bog is small. No map of ARB available but cutting likely to be within 100m of the ARB recorded in 2014. Estimate 10% loss of ARB since last surveyed.
Mayo	Cloonfeightrin Bog	None	3.0	L	First reported in 2018 from desktop review. Impacts on ARB likely as drainage inserted in the southern part of the high bog. No map of ARB available but drainage likely to be within 100m of the ARB reported. Estimate 10% loss of ARB since last surveyed.
Sligo	Coolrawer Bog	None	3.6	L	Impacts on ARB likely as cutting in the south-east of the site appears to be of a high intensity. No map of ARB available but cutting likely to be within 100m of the ARB reported. Estimate 10% loss of ARB since last assessed.

County	Bog Name	Most recent survey year	ARB (ha)	CI	Comment
Galway	Cooloo Bog	None	6.0	H	Impacts on ARB likely as cutting appears to be of a high intensity and a series of new drains were inserted on the high bog (between time of digiglobe imagery of May 2012 and World imagery of Sep 2019 - from Google Earth would appear to have been inserted after July 2018). No map of ARB available but cutting and/or drainage likely to be within 100m of the ARB reported. Estimate that 25% of ARB lost due to cutting and drainage during reporting period.
Galway	Croaghill Bog	None	3.0		On the Bluesky imagery and World imagery 2022, the high bog looks very wet and appears to contain extensive pool systems. The c. 2ha estimate (from a previous desktop analysis in 2018) likely to have been an underestimate.
Tipperary	Tombrickane Bog	None	0.0	VH	The 0.25ha estimate given in 2018 was estimated to be a minimum. Since then cutting has been at an industrial-like scale with an intensive amount of high bog drainage also inserted. Losses of ARB are likely to the extent that ARB may no longer be present on site.

Appendix 8 ARB on cutover

ARB has been recorded on the cutovers of the following sites during the reporting period. Small areas of ARB has also been recorded from the cutovers of additional sites (e.g. Flughany Bog SAC 000497) by BnM but the data has not been compiled yet.

Site Code	Site Name	Bog Name	Survey year	ARB (ha)	Project
000572	Clara Bog SAC	Clara Bog	2021	1.0	LB
000580	Mongan Bog SAC	Mongan Bog	2021	0.4	LB
000582	Raheenmore Bog SAC	Raheenmore Bog	2020	0.2	LB
000597	Carrowbehy/Caher Bog SAC	Carrowbehy/Caher Bog	2021	2.2	LB
000679	Garriskil Bog SAC	Garriskil Bog	2021	0.6	LB
001242	Carrownagappul Bog SAC	Carrownagappul Bog	2021	0.1	LB
N/A	Shanakyle Bog (Clare)	Shanakyle Bog	2021	1.1	O'Loughlin (2022)
N/A	Knocknanuss cutover (Tipperary)	Knocknanuss cutover	2024	0.4[1]	Crushell *et al.* (2024b)
N/A	Gortnaderrary Bog North (Leitrim)	Gortnaderrary Bog North	2024	0.3[1]	Crushell *et al.* (2024d)

[1] This was a walkover survey in which the extent of ARB was not comprehensively mapped.

Appendix 9 Assessment of the ranking of Pressures/Threats on ARB at site level

Description of the pressures and threats detailed by the EU Article 17 guidance documents for the 2019-24 reporting period as well as a comment highlighting how the pressure was interpreted as part of this project and details of how each pressure and threat was ranked per site

Code	Pressure/ threat	Description	Comment	High	Medium	Low	N/A
PA01	Conversion into agricultural land (excluding drainage and burning)	Conversion of natural and semi-natural non-agricultural habitats (*e.g*. semi-natural forests) and non-agricultural habitats of species targeted by the nature directives into agricultural land (*e.g*. pastures, meadows, arable fields). This pressure does not relate only to land use changes that occurred during the reporting period, but it refers to instances where continuing the agricultural use of originally non-agricultural habitat prevent the latter from being restored (*e.g*. in case of land use conflicts between agriculture and nature conservation)	Included as a pressure where NPWS site-specific restoration plans identify agricultural land as preventing a site from meeting conservation targets, and/or where newly recorded reclamation works are considered likely to hinder achievement of the site's ARB targets	Where existing or newly created agricultural land prevents ARB targets from being achieved on the high bog	Where existing or newly created agricultural land prevents the achievement of bog peat-forming habitat targets on cutover	Where agricultural land was reclaimed during the reporting period but is not thought to impact ARB or bog peat-forming habitats targets	Where agricultural land is not considered to impact on restoration targets and no reclamation occurred during the reporting period
PA22	Drainage for use as agricultural land	Activities like water abstraction, hydrological modifications, canalisation aimed at draining natural or semi-natural habitats for the use as agricultural land (*e.g*. drainage of wetlands for agriculture)	Included as a pressure where agricultural-related drainage works were noted during the reporting period or where the NPWS's site-specific restoration plans indicate that drainage associated with agriculture is impeding a site from achieving conservation targets	Where such drainage prevents ARB targets from being achieved on the high bog	Where such drainage prevents the achievement of bog peat-forming habitat targets on cutover	Where such drainage has occurred during the reporting period but is not thought to impact ARB or bog peat-forming habitats targets	Where such drainage is not thought to impact restoration targets and no drainage associated with agriculture occurred during the reporting period

Code	Pressure/ threat	Description	Comment	High	Medium	Low	N/A
PB01	Conversion to forest from other land uses, or afforestation (excluding drainage)	Increase in forest area, including planting of forests on grassland or heathland, or converting shrubs into forest. This pressure does not relate only to land use changes that occurred during the reporting period but it refers to instances where continuing the current forestry use of a natural/semi-natural habitat prevents the latter from being restored (*e.g.* in cases of land use conflicts between forestry and nature conservation for the restoration of some heathlands and peats, which were in the past afforested and are currently being managed and replanted as forests).	Included as a pressure where the NPWS's site-specific restoration plans indicate that forestry is impeding a site from achieving conservation targets.	Where existing or newly planted forestry prevents ARB targets from being achieved on the high bog (restoration plan usually defines this)	Where existing or newly planted forestry prevents the achievement of bog peat-forming habitat targets on cutover and/or plantation is on high bog	Where plantation forestry occurs within the site but is not thought to impact ARB or bog peat-forming habitats targets (restoration plan usually defines this)	Where no plantation forestry exists within the site boundary
PB24	Drainage for forestry	Activities like water abstraction, hydrological modifications, canalisation aimed at draining natural or semi-natural forest habitats (*e.g.* drainage of wetlands for forestry).	Included as a pressure where the NPWS's site-specific restoration plans indicate that forestry is impeding a site from achieving conservation targets.	Where such drainage prevents ARB targets from being achieved on the high bog	Where such drainage prevents the achievement of bog peat-forming habitat targets on cutover and/or is on high bog	Where such drainage occurs within the site but is not thought to impact ARB or bog peat-forming habitats targets	Where no drainage associated with plantation forestry exists within the site boundary
PC05	Peat extraction and associated drainage	Extraction of peat (*e.g.* cutting of peat and mechanical removal of peat). Includes drainage associated with peat extraction.	Included as a pressure where turf cutting has occurred during the reporting period. Note that this pressure then includes any drainage across the bog associated with turf cutting (past or present) if the drainage impedes the	Where peat cutting occurred within the site during the reporting period and that cutting or associated	Where peat cutting occurred within the site during the reporting period and that cutting or associated	Where peat cutting occurred within the site during the reporting period and that cutting or associated	Where no peat cutting occurred within the site during the reporting period

Code	Pressure/ threat	Description	Comment	High	Medium	Low	N/A
			bog from achieving the conservation targets set out in the NPWS site-specific restoration plans. Where turf cutting did NOT occur during the reporting period but associated drainage still impedes the bog from achieving its conservation targets, the drainage is reported under PL02.	drainage prevents ARB area targets from being achieved on the high bog (a guideline of cutting and/or drainage within 100m of ARB or DRB is used)	drainage prevents ARB S&F targets from being achieved on the high bog (a guideline of cutting and/or drainage within 100-500m of ARB or DRB is used)	drainage is not impacting ARB targets. This is a rare scenario and is largely restricted to instances where the cutting is on isolated lobes of high bog and there are no associated drains impacting ARB or DRB	
PE01	Roads, paths, railroads and related infrastructure	Construction and operation (*e.g.* collisions, traffic, noise, light, fencing associated with roads, use of salt for snow cleaning *etc.*) of road and related infrastructure (*e.g.* bridges, viaducts, tunnels) and related pressures such as animal mortality, habitat fragmentation, improved access to sites via roads and paths.	Included as a pressure where drainage associated with railway or path is impeding the bog from achieving its conservation targets set out in the site-specific restoration plan.	Where such drainage prevents ARB targets from being achieved on the high bog	Where such drainage prevents the achievement of bog peat-forming habitat targets on cutover	Where such drainage has occurred during the reporting period but is not thought to impact ARB or bog peat-forming habitats targets	Where such drainage is not thought to impact restoration targets and where no drainage associated with roads/paths/railroads occurred during the reporting period

Code	Pressure/ threat	Description	Comment	High	Medium	Low	N/A
PH08	Other human intrusions and disturbance	Other human intrusions and disturbance not mentioned under other PH category codes in the EU list of pressures and threats.	Included as a pressure where burning was recorded during the reporting period. The cause/reason for the burning not always clear.	Where burning impacted on ARB during the reporting period	Where burning impacted on parts of the high bog but not on ARB during the reporting period.	Where burning did not occur during the reporting period, but the evidence of past burns is still impacting on ARB vegetation	Where no burning occurred during the reporting period and little or no evidence of past burns is evident within ARB vegetation
PI02	Other invasive alien species (other than species of Union concern)	Problems related to other 'invasive' alien species (any species introduced in modern period that is established in the wild outside its natural range and whose introduction and/or spread represent a threat or a potential threat to habitats and species, regardless of the invasive population dynamics) other than invasive alien species of Union concern (under Regulation (EU) No 1143/2014), for which code I01 should be used).	Included as a pressure where an invasive species such as *Rhododendron ponticum*, *Sarracenia purpurea* or exotic conifers were recorded at abundances that may impact on the conservation targets.	Where invasive species impact the extent of ARB on the high bog	Where invasive species impact the S&F of ARB on the high bog or bog peat-forming habitat on cutover	Where invasive species are present at levels that currently do not impact ARB or bog peat-forming habitats targets but may impact them within two reporting periods	Where little or no invasive species are recorded within the site
PI03	Problematic native species	Harmful plants, animals, that are originally found within the ecosystem(s) in question but have become out-of-balance directly or indirectly due to human activities. This pressure should be used if problems with native species cannot be associated with other more specific drivers/pressures (e.g. when problems with native species	Included as a pressure where native species (*e.g.* *Betula pubescens*) were reported as spreading onto the bog and potentially impeding the achievement of conservation targets.	Where problematic native species are spreading on the high bog and impacting on	Where problematic native impact the S&F of ARB on the high bog or bog peat-forming	Where problematic native species are present at levels that currently do not impact	No issue with the spread of problematic native species recorded within the site

Code	Pressure/ threat	Description	Comment	High	Medium	Low	N/A
		can be associated with multiple human activities or more precise activities are unknown).		the extent of ARB	habitat on cutover	ARB or bog peat-forming habitats targets but may impact them within two reporting periods	
PJ01	Temperature changes and extremes due to climate change	Periods in which temperatures exceed or go below the normal range of variation. Includes, for example, heat waves, cold spells, oceanic temperature changes, disappearance of glaciers/sea ice.	This pressure was reported on a broad basis across the country with all western raised bog sites classed as being under low pressure from PJ01 and all midland sites classed as being under medium pressure.	N/A	All sites east of the Shannon and south of c. Longford	All sites west of the Shannon and/or north of c. Longford	N/A
PJ03	Changes in precipitation regimes due to climate change	Periods in which rainfall falls below or above the normal range of variation. Includes, for example, severe lack of rain, loss of surface water sources, but also increased quantity and intensity of rain.	This pressure was reported on a broad basis across the country with all western raised bog sites classed as being under low pressure from PJ03 and all midland sites classed as being under medium pressure.	N/A	All sites east of the Shannon and south of c. Longford	All sites west of the Shannon and/or north of c. Longford	N/A
PK04	Atmospheric N-deposition	This pressure is to be used when atmospheric nitrogen deposition is identified as the key contributing pressure but the source of which is either mixed or from too many sources to identify a main source. Nitrogen compounds can be either gaseous form or dry deposition (particulate matter) or precipitation (wet deposition). Sources can be natural (e.g. volcanic, oceanic, biological decay), biogenic (*e.g.* agricultural fertilisers) or	While Critical Loads (amount of nitrogen deposited onto the bog including both wet and dry deposition) are referred to in the SSCOs, this can be difficult to measure. Thus, modelled Critical Levels (the concentration of NOx/ ammonia in the air, some of which will be deposited)	Site modelled as having > 3 µg NH3 m^{-3} and/or field survey reported strong evidence of damage to ARB vegetation in	Site modelled by as having 2 – 3 µg NH3 m^{-3} and/or field survey reported some evidence of atmospheric ammonia deposition	Site modelled by as having 1 – 2 µg NH3 m^{-3} and/or field survey reported little to no evidence of atmospheric ammonia deposition	Site modelled by as having <1 µg NH3 m^{-3}) and/or field survey reported no evidence of atmospheric ammonia deposition impacting

Code	Pressure/ threat	Description	Comment	High	Medium	Low	N/A
		industrial (*e.g.* fuel combustion, coal and power plants, settlements) and can be either point or diffuse sources. Where the main source can be identified, this should be reported under the relevant sector and not under mixed source pollution.	was used to assess the pressure. Two sources (using modelled Critical Levels) were used to assess this pressure; Kelleghan *et al*. (2019) and the online app Air Pollution Information System (https://www.apis.ac.uk/app). This assessment was updated for sites where indications of nitrogen deposition damage (as detailed by Kelleghan *et al*., 2022) was recorded during field surveys.	line with that reported by Kelleghan *et al*. (2022).	impacting vegetation on the site	impacting vegetation on the site	vegetation on the site
PL02	Drainage	Drainage including landfill, land reclamation and drying out should only be reported under this category when the key driver of the change is unclear or where these changes are related to several causes. Where a key sectoral driver(s) can be identified, the pressure/threat should be reported under the corresponding sectoral category.	This pressure was reported on bogs where turf cutting has ceased (did not occur during the reporting period) but drains that are proposed to be blocked according to the site-specific restoration plan remain open. These are typically drains that were once associated with abandoned turf cutting.	Where such drainage prevents ARB targets from being achieved on the high bog (restoration plan usually defines this)	Where such drainage prevents the achievement of bog peat-forming habitat targets on cutover	Where such drainage occurs within the site but is not thought to impact on ARB targets or targets for peat-forming habitats on cutover	Where all drainage (not attributable to agriculture or forestry etc.) proposed to be blocked by a site's restoration plan have been blocked

Appendix 10 Assessment of the ranking of Conservation Measures on ARB at site level

Description of the conservation measures detailed by the EU Article 17 guidance documents for the 2019-24 reporting period as well as a comment highlighting how the measure was interpreted as part of this project and details of how each conservation measure was ranked per site

Code	Conservation Measure	Description	Comment	High	Medium	Low
MA13	Manage agricultural drainage and water abstraction (incl. the restoration of drained or hydrologically altered habitats)	Managing drainage and irrigation operations and infrastructures (such as surface and groundwater abstraction, construction and operation of dams or altering of hydrological flow of rivers) as well as managing or restoring the hydrological regime of drained agricultural areas (e.g. restoration of hydrological regimes of drained peatlands, hydrologically altered wetlands and freshwater habitats in agricultural areas). The management of drainage and irrigation can include the possible cessation of these activities. This measure also includes restoring other freshwater habitats or wetlands impacted by changes of hydrological functioning through activities such as building dams or surface water abstraction for agriculture.	Included as a conservation measure where agricultural drainage has been blocked or partially blocked as part of restoration works on a site.	Where such works were assessed as having a positive impact on the extent of ARB	Where such works were assessed as having a positive impact on the achievement of bog peat-forming habitat targets on cutover	Where such works were undertaken on the cutover and assessed as not impacting on the achievement of ARB or bog peat-forming habitat targets

Code	Conservation Measure	Description	Comment	High	Medium	Low
MA14	Other measures related to agricultural practices	Other measures related to agricultural practices or agriculture-related habitats not covered by the other MA measures e.g. adapting the methods and/or timing of harvesting to avoid disturbance of nesting birds.	Included as a conservation measure where measures have been undertaken to limit the loss of nitrogen gases into the atmosphere from agricultural practices such as from the spreading of slurry.	This conservation measure was not ranked during this assessment		
MB14	Manage drainage and water abstraction for forestry (inc. restoration of drained or hydrologically altered habitats)	Managing drainage and water extraction operations and infrastructure (including surface and groundwater abstraction, construction and operation of dams and altering of hydrological flow of rivers) as well as managing or restoring the hydrological regime of drained forest areas. The management of drainage and irrigation can include the possible cessation of these activities. This measure also includes restoring freshwater habitats impacted by changes of hydrological functioning due to drainage for forestry.	Included as a conservation measure where conifer plantations have been removed and associated drainage blocked with the aim of restoring wetland areas and helping site to achieve conservation targets.	Where such works were assessed as having a positive impact on the extent of ARB	Where such works were undertaken on the high bog (but not impacting ARB extent) and/or assessed as having a positive impact on the achievement of bog peat-forming habitat targets on cutover	Where such works were undertaken on the cutover and assessed as not impacting on the achievement of ARB or bog peat-forming habitat targets
MC02	Adapt/manage exploitation of energy resources	Adapting and managing (including stopping and avoiding) the exploitation of energy resources (coal mining, incl. open-cast mining, peat extraction, oil and gas exploration and drilling). Also includes reducing the impact from geotechnical surveying and other preparatory works for extraction.	Included as a conservation measure where turf cutting activities have declined or ceased on a site and/or restoration plans (RP) and/or drainage management plans (DMP) have been designed.	RP and DMP developed. Turf cutting ceased or if occurring is only on an isolated lobe of bog and not impacting on ARB targets	RP and DMP developed. Significant reduction in turf cutting levels but still ongoing and potentially impacting ARB targets	RP and DMP developed. Little or no reduction in turf cutting levels and cutting impacting ARB targets

Code	Conservation Measure	Description	Comment	High	Medium	Low
MC07	Habitat restoration/creation from resources, exploitation areas or areas damaged due to installation of renewable energy infrastructure	Land previously used or prepared for mineral extraction (e.g. gravel extraction, quarry), energy resources extraction (e.g. coal or peat) or damaged due to depositing of extraction material or due to construction and operation of renewable energy infrastructure being restored as Annex I habitat type and/or habitat of a species targeted by the nature directives. This includes either active or passive restoration allowing for natural succession.	Included as a conservation measure where drains associated with turf cutting activities (past or present) have been blocked as part of restoration works. Also includes any drains along (turf-cutting) access tracks that were blocked.	Where such works were assessed as having a positive impact on the extent of ARB	Where such works were undertaken on the high bog (but not impacting ARB extent) and/or assessed as having a positive impact on the achievement of bog peat-forming habitat targets on cutover	Where such works were undertaken on the cutover and assessed as not impacting on the achievement of ARB or bog peat-forming habitat targets
MI03	Management, control or eradication of other invasive alien species	Managing, controlling the spread of other 'invasive' alien species (i.e. any species introduced in modern period that is established in the wild outside its natural range and whose introduction and/or spread represents a threat or a potential threat to habitats and species, regardless of the invasive population dynamics (e.g. controlling Acacia spp.)) or eradicating established populations of other alien species.	Included as a conservation measure where control and/or eradication program has been implemented to combat the impacts of invasive species on the conservation targets of a site.	Where such works were assessed as having a positive impact on the extent of ARB	Where such works were assessed as having a positive impact on achieving ARB S&F and/or on the achievement of bog peat-forming habitat targets on cutover	Where such works were undertaken on the cutover and assessed as not impacting on the achievement of ARB or bog peat-forming habitat targets

Code	Conservation Measure	Description	Comment	High	Medium	Low
MI05	Management of problematic native species	Managing native plants and animals that have become out-of-balance directly or indirectly due to human activities and, in certain regions, may be causing damage to habitats (e.g. deer jeopardising forest restoration) or threatening population of target species (e.g. gulls predating on eggs and chicks of a threatened bird). This also includes managing impacts of feral populations.	Included as a conservation measure where control and/or eradication program has been implemented to combat the impacts of problematic native species on the conservation targets of a site.	Where such works were assessed as having a positive impact on the extent of ARB	Where such works were assessed as having a positive impact on achieving ARB S&F and/or on the achievement of bog peat-forming habitat targets on cutover	Where such works were undertaken on the cutover and assessed as not impacting on the achievement of ARB or bog peat-forming habitat targets
MK03	Restoration of habitats impacted by multi-purpose hydrological changes	Restoring freshwater, wetlands and coastal habitats impacted by multi-purpose hydrological modifications. This excludes restoration of habitats reported under MA07, MA13, MB08, MB14, MC04, ME06, MF08 or MF09.	Included as a conservation measure where enhanced restoration works have taken place on a site to achieve restoration targets. This includes the construction of contour bunds and cell bunding.	Where such works were assessed as having a positive impact on the extent and/or S&F of ARB	Where such works were assessed as having a positive impact on the achievement of bog peat-forming habitat targets on cutover	Where such works were undertaken on the cutover and assessed as not impacting on the achievement of ARB or bog peat-forming habitat targets

Appendix 11 Ecotope data from 2010-18 used in estimating national ARB extent

List of sites that were surveyed in the 2010-18 period and are included as "Other data" in section 3.1.1.4. Projects are abbreviated as follows: Raised Bog Monitoring Project, 2014 (RBMP14); NHA Surveys, 2018 (NHAS18); The Living Bog (LB); Bord na Móna Surveys (BnM); Coillte LIFE surveys (Coillte), Article 6.3 NPWS surveys (Art 6.3) and NPWS surveys (NPWS).

Site Code	Site Name	Bog Name	Survey year	ARB (ha)	Project/Source
000566	All Saints Bog and Esker SAC	All Saints Bog	2011	39.8	RBMP14
000391	Ballynafagh Bog SAC	Ballynafagh Bog	2011	6.5	RBMP14
000592	Bellanagare Bog SAC	Bellanagare Bog	2013	49.6	RBMP14
002347	Camderry Bog SAC	Camderry Bog	2012	6.2	RBMP14
002336	Carn Park Bog SAC	Carn Park Bog	2013	3.1	RBMP14
000614	Cloonshanville Bog SAC	Cloonshanville Bog	2012	20.1	RBMP14
002337	Crosswood Bog SAC	Crosswood Bog	2012	4.6	RBMP14
002350	Curraghlehanagh Bog SAC	Curraghlehanagh Bog	2012	9.8	RBMP14
000006	Killyconny Bog SAC	Killyconny Bog	2011	3.9	RBMP14
000285	Kilsallagh Bog SAC	Kilsallagh Bog	2012	11.5	RBMP14
002333	Knockacoller Bog SAC	Knockacoller Bog	2012	4.8	RBMP14
000296	Lisnageeragh Bog and Ballinastack Turlough SAC	Lisnageeragh Bog	2012	29.6	RBMP14
000297	Lough Corrib SAC	Addergoole Bog	2012	39.2	RBMP14
001818	Lough Forbes Complex SAC	Ballykenny Bog	2011	7.6	RBMP14
001818	Lough Forbes Complex SAC	Fisherstown Bog	2012	1.3	RBMP14
002351	Moanveanlagh Bog SAC	Moanveanlagh Bog	2012	4.6	RBMP14
002352	Monivea Bog SAC	Monivea Bog	2012	7.0	RBMP14
002353	Redwood Bog SAC	Redwood Bog	2012	12.1	RBMP14
000585	Sharavogue Bog SAC	Sharavogue Bog	2011	25.8	RBMP14
000382	Sheheree (Ardagh) Bog SAC	Sheheree Bog	2012	4.1	RBMP14
000281	Keeloges Bog NHA	Keeloges Bog West	2018	24.5	NHAS18
000229	Ballygar Bog NHA	Ballygar Bog	2018	19.0	NHAS18
000280	Castle Ffrench West Bog NHA	Castle Ffrench West Bog	2018	1.3	NHAS18
000321	Raford River Bog NHA	Raford River Bog	2018	8.7	NHAS18
000333	Anna More Bog NHA	Anna More Bog	2018	0.9	NHAS18
000640	Arragh More Bog NHA	Arragh More Bog	2018	5.5	NHAS18
000652	Ballymacegan Bog NHA	Ballymacegan Bog	2018	3.3	NHAS18

Site Code	Site Name	Bog Name	Survey year	ARB (ha)	Project/Source
000652	Monaincha Bog/Ballaghmore Bog NHA	Monaincha Bog	2018	2.4	NHAS18
000674	Ballynagrenia and Ballinderry Bog NHA	Ballynagrenia Bog	2018	19.5	NHAS18
000684	Lough Derravaragh NHA	Lough Derravaragh	2018	2.7	NHAS18
000694	Wooddown Bog NHA	Wooddown Bog	2018	1.6	NHAS18
001244	Castle Ffrench East Bog NHA	Castle Ffrench East Bog	2018	0.5	NHAS18
001254	Derrinlough Bog NHA	Derrinlough Bog	2018	2.3	NHAS18
001450	Mount Jessop Bog NHA	Mount Jessop Bog	2018	0.2	NHAS18
001623	Carrickynaghtan Bog NHA	Carrickynaghtan Bog (retained)	2018	59.6	NHAS18
002323	Milltownpass Bog NHA	Milltownpass Bog	2018	2.8	NHAS18
000993	Ayle Lower Bog NHA	Ayle Lower Bog	2018	0	NHAS18
000597	Carrowbehy/Caher Bog SAC	Carrowbehy Bog	2017	72.8	LB
002332	Coolrain Bog SAC	Coolrain Bog	2016	2.2	Art 6.3
002340	Moneybeg and Clareisland Bogs SAC	Moneybeg Bog	2015	1.5	Art 6.3
002340	Moneybeg and Clareisland Bogs SAC	Clareisland Bog	2015	3.8	Art 6.3
002338	Drumalough Bog SAC	Drumalough Bog East	2018	10.0	NPWS
N/A	Kilcolumb Bog	Kilcolumb Bog	2018	0.5	NPWS
N/A	Annaghmore East Bog	Annaghmore East Bog	2018	0.2	NPWS
N/A	Cloonshannagh Bog	Cloonshannagh Bog	2017	5.1	NPWS
002191	XX proposed SAC	XX Bog	2010	3.8	BnM
002192	XX proposed SAC	XX Bog	2017	0.2	BnM
002192	XX proposed SAC	XX Bog	2010	0	BnM
002192	XX proposed SAC	XX Bog	2010	4.1	BnM
002192	XX proposed SAC	XX Bog	2010	0	BnM
002192	XX proposed SAC	XX Bog	2010	0	BnM
002201	Derragh Bog SAC	Derragh Bog	2015	0.2	Coillte
N/A	Cornaveagh (Blackwater)	Cornaveagh (Blackwater)	2016	0.5	BnM
N/A	Bracklin (Ballivor)	Bracklin (Ballivor)	2017	0.6	BnM
N/A	Newtown/Loughgore	Newtown/Loughgore	2016	4.8	BnM
N/A	Kellysgrove Bog	Kellysgrove Bog	2017	0.1	BnM

Appendix 12 Pressures/Threats ranked by site

Table showing the main pressures/threats impacting the site during the reporting period (2019-24) listed as whether the pressure/threat is estimated to be having a Low (L), Medium (M) or High (H) influence. See Appendix 9 for description of codes.

Site Code	Bog Name	PA 01	PH 08	PA 22	PB 01	PB 24	PC 05	PE 01	PI 02	PI 03	PJ 01	PJ 03	PK 04	PL 02
000422	Aghnamona Bog				M	M	H		L		L	L	M	
000564	Annagh Bog										M	M	M	H
002341	Ardagullion Bog					L					L	L	M	H
001227	Aughrim Bog				M	M			L		L	L	L	H
000641	Ballyduff Bog	L		M						L	M	M	H	H
000235	Bracklagh Bog				H	H	H		L		L	L	L	
002346	Brown Bog					L				M	M	M	M	H
000595	Callow Bog		H		H	H	H				L	L	L	
001242	Carrownagappul Bog								L		L	L	L	L
001405	Cashel Bog						H				L	L	M	
000572	Clara Bog	M		M							M	M	M	H
000677	Cloncrow Bog				H	H			L		M	M	M	L
000641	Clonfinane Bog		L							L	M	M	H	H
000216	Cloniff Bog				L	L					M	M	M	H
000565	Clonydonnin Bog										M	M	M	H
000600	Cloonchambers Bog						H				L	L	L	
002348	Clooneen Bog		M				H		M		L	L	M	
002110	Cloonfelliv Bog			L							L	L	L	H
002298	Cloongoonagh Bog						H				L	L	L	
002349	Corbo Bog	M		M			H				L	L	L	
002110	Corliskea Bog				H	H	H		L		L	L	L	
002033	Daingean Bog		L		L	L	H				M	M	M	
000604	Derrinea Bog			H							L	L	L	H
002298	Derrynabrock Bog		M	L	H	H					L	L	L	H
000575	Ferbane Bog	M		M						L	M	M	M	L
000647	Firville Bog	L	H	L							M	M	H	H
000497	Flughany Bog			M			H				L	L	L	
000679	Garriskil Bog								L		L	L	L	L
001580	Girley Bog					M			L		M	M	M	H
002298	Gowlaun Bog		H		M	M					L	L	L	H
000647	Kilcarren Bog	L	H	L	M	M					M	M	M	H

Site Code	Bog Name	PA 01	PH 08	PA 22	PB 01	PB 24	PC 05	PE 01	PI 02	PI 03	PJ 01	PJ 03	PK 04	PL 02
002298	Kilgarriff Bog		M		H	H					L	L	L	H
000873	Lenareagh Bog				L	L	M		L		L	L	L	
001812	Lough Garr Bog				M	M			L		M	M	M	H
000307	Lough Tee Bog East				H	H	H		L		L	L	L	
000580	Mongan Bog	M		M				M			M	M	L	L
000221	Moorfield Bog/Farm Cottage Bog				M	M			L		L	L	L	H
002342	Mount Hevey Bog				L	L			L	L	M	M	H	H
000873	Moyarwood Bog				H	H	H				L	L	L	
000581	Moyclare Bog									L	M	M	M	L
000873	Paul's Lough Bog						H				L	L	L	
000582	Raheenmore Bog	M		H							M	M	M	L
000937	Scohaboy Bog				M	M			L		M	M	M	L
000326	Shankill West Bog			H	L	L					L	L	M	H
002298	Tawnaghbeg Bog				H	H					L	L	L	H
002110	Trien Bog			M					L		L	L	L	H

Appendix 13 Examples of High bog drainage inserted on non-designated sites during the reporting period

An incomplete analysis of aerial imagery highlighted that high bog drainage continues to be inserted on the high bog of many non-designated sites. The following lists some of these sites:

- Drumer Bog, which lies in County Roscommon 4km south-west of Carrick-on-Shannon. Drumer Bog was predicted to support DRB by the eco-hydrological model (NPWS, 2014). A large drainage network, which covers approximately 10ha of the high bog equating to c. 25% of the high bog surface was inserted in the north of the high bog in c. 2020.
- Cloonfeightrin Bog in County Mayo, which lies 9km to the south-east of Tubbercurry. This site has not been surveyed but Fernandez & Eakin (in prep.) estimated that a minimum of 3.5ha of ARB was present from aerial imagery. A large drainage network was inserted in the south of the high bog from c. mid-2010s onwards and covers approximately 5ha of the high bog equating to c. 25% of the high bog surface.
- Tombrickane Bog, which lies 4km north-west of Borrisokane in County Tipperary. This site has not been surveyed but Fernandez & Eakin (in prep.) estimated that a minimum of 0.25ha of ARB was present from aerial imagery. The drainage network inserted in the east of the high bog on this site from c. mid-2010s onwards covers approximately 20ha of the high bog equating to c. 50% of the high bog surface. The presence of ARB here is now unlikely.
- Thesheehys Bog, which lies 2.5km south-east of Roscrea in County Tipperary. This site has not been surveyed or assessed for potential DRB by Fernandez & Eakin (in prep). However, c. 50ha of intact high bog was present in the mid-2010s. Exploitation has since resulted in a drainage network being inserted across the entire high bog.
- Derrymore Bog, which lies 3km to the south-east of Longford Town. This site has not been surveyed or assessed for potential DRB by Fernandez & Eakin (in prep.). By the mid-2010s this site already had an intensive drainage network inserted across most of the c. 85ha of high bog. This appears to have further intensified over the reporting period with all but c. 10ha of the high bog part of the drainage network by 2024.
- Baltrasna Bog, 4km to the south-east of Mullingar in County Westmeath. This site has not been surveyed or assessed for potential DRB by Fernandez & Eakin (in prep.). In the mid-2010s this site supported c. 50ha of relatively intact high bog. However, in the mid-late 2010s an intensive drainage network was inserted across the entire high bog.
- Woodfield Bog, 3km north of Clara in County Offaly. This site has not been surveyed or assessed for potential DRB by Fernandez & Eakin (in prep.). In the mid-2010s this site supported c. 90ha of relatively intact high bog (The north-eastern section had already been drained before the 2010s). However, in the late-2010s/early 2020s an intensive drainage network was inserted across 20ha of the north-western section of high bog.

- Cornaveagh/Clonshask Bog in County Offaly, 3km north-west of Shannonbridge. This site has not been surveyed or assessed for potential DRB by Fernandez & Eakin (in prep.). In the mid-2010s this site supported c. 30ha of relatively intact high bog. However, in the mid-late 2010s an intensive drainage network was inserted across almost the entire high bog.
- Monksland Bog, 2km south-west of Athlone in County Roscommon. This site has not been surveyed or assessed for potential DRB by Fernandez & Eakin (in prep.). In the mid-2010s this site supported c. 15ha of relatively intact high bog. However, in the late 2010s/early 2020s an intensive drainage network was inserted across almost the entire high bog.
- Aghafin Bog in County Roscommon, 2km north-west of Drumshanbo. This site has not been surveyed or assessed for potential DRB by Fernandez & Eakin (in prep.). In the mid-2010s this site supported c. 40ha of relatively intact high bog. However, in the early 2020s an intensive drainage network was inserted across c. 15ha of the southern extent of high bog.
- Cooloo Bog, 5km west-north-west of Moylough in County Galway. This site was not surveyed by Fernandez & Eakin (in prep.) but was assessed by them as likely supporting a minimum of 8ha of ARB as well as being predicted to support DRB by the eco-hydrological model. A series of parallel drains was inserted in the west of the high bog on this site in the late 2010s. These drains are c. 150m in length and occur every c. 15m.
- Moonbawn Bog, 6km south-west of Portlaois in County Laois. This site was not surveyed by Fernandez & Eakin (in prep.) but was predicted to support DRB by the eco-hydrological model (NPWS, 2014). However, the cutting intensity since then has been very high with an estimated c. 20% of the high bog lost to cutting from 2012-2022. Extent of high bog remaining is <40ha and little drains to block so DRB may no longer be present.
- Ballina Bog, in County Kildare, 7km west of Enfield. This site was not surveyed by Fernandez & Eakin (in prep.) but was assessed as likely supporting DRB (although no eco-hydrological model was available). Extensive turf cutting, drainage and agricultural land reclamation has been ongoing on this site and the likelihood of DRB being present on the site continues to decrease.
- Bracklin Big Bog, 4km north-east of Tullamore in County Offaly. This site was not surveyed by Fernandez & Eakin (in prep.) but was assessed by them as likely supporting DRB. Although a network of drains was already present on this site by the early 2010s, the drainage intensified during the mid-late 2010s.

Appendix 14 Lengths of drains blocked within SACs

Summary of the lengths of drains blocked within each of the 62 raised bog SACs[1] during the reporting period, prior to the reporting period, overall and as measured against the total length of drains proposed to be blocked in the restoration plans. Note that in some instances, a figure of greater than 100% is given for percentage of drains blocked. This can occur where the works on the ground go beyond what was initially planned or where new drains were excavated or discovered since the plans were made in 2016. Note also that the lengths of drains blocked on Clara East in the 1990s was estimated by Crushell *et al*. (2014) as 400km. Sites marked with an asterix * have had drains blocked as part of a Coillte LIFE project but the exact figures for the lengths of drain blocked are unavailable.

Name of SAC	Total length of drains to be blocked (km)	Length of drains blocked pre-2019		Length of drains blocked 2019-24		Total drains blocked by November 2024	
		(km)	% of total to be blocked	(km)	% of total to be blocked	(km)	% of total to be blocked
All Saints	22.8	0.0	0.0	32.5	142.3	32.5	142.3
Ardagullion	14.5	2.2	15.4	10.8	74.6	13.1	90.0
Ardgraigue[2]	31.6	0.0	0.0	0.0	0.0	0.0	0.0
Ballyduff/Clonfinane	34.1	23.0	67.4	0.0	0.0	23.0	67.4
Ballynafagh	27.2	0.0	0.0	0.0	0.0	0.0	0.0
Ballynamona	15.6	0.0	0.0	0.0	0.0	0.0	0.0
Barroughter	24.9	0.0	0.0	0.0	0.0	0.0	0.0
Bellanagare	132.0	34.1	25.9	0.0	0.0	34.1	25.9
Brown Bog[2]	5.4	0.0	0.0	0.0	0.0	0.0	0.0
Callow	80.5	0.0	0.0	0.0	0.0	0.0	0.0
Camderry[2]	23.2	1.3	5.5	9.7	41.7	11.0	47.2
Carn Park[2]	34.8	0.0	0.0	0.0	0.0	0.0	0.0
Carrowbehy/Caher	25.2	4.9	19.3	15.0	59.4	19.9	78.7
Carrownagappul	51.3	4.7	9.1	48.4	94.3	53.1	103.5
Clara	426.5	400.1	93.8	20.4	4.8	420.5	98.6
Cloonchambers	22.7	0.0	0.0	0.0	0.0	0.0	0.0
Clooneen	10.3	0.0	0.0	0.0	0.0	0.0	0.0
Cloonmoylan	66.9	0.0	0.0	0.0	0.0	0.0	0.0
Cloonshanville	13.1	0.2	1.3	0.0	0.0	0.2	1.3
Coolrain	15.5	1.1	7.0	0.0	0.0	1.1	7.0
Corbo	26.9	0.0	0.0	0.0	0.0	0.0	0.0
Corliskea/Trien/Cloonfelliv	104.2	0.0	0.0	0.0	0.0	0.0	0.0
Crosswood	25.4	0.0	0.0	12.1	47.7	12.1	47.7
Curraghlehanagh[2]	32.4	0.0	0.0	17.6	54.2	17.6	54.2
Derrinea	3.5	0.0	0.0	0.0	0.0	0.0	0.0

Name of SAC	Total length of drains to be blocked (km)	Length of drains blocked pre-2019		Length of drains blocked 2019-24		Total drains blocked by November 2024	
		(km)	% of total to be blocked	(km)	% of total to be blocked	(km)	% of total to be blocked
Drumalough[2]	15.9	0.0	0.0	11.5	72.5	11.5	72.5
Ferbane	21.6	0.0	0.0	19.5	90.2	19.5	90.2
Flughany	46.8	0.0	0.0	0.0	0.0	0.0	0.0
Garriskil	27.3	12.6	46.4	14.8	54.1	27.4	100.5
Kilcarren-Firville	32.6	0.0	0.0	0.0	0.0	0.0	0.0
Killyconny	18.8	6.4	34.0	11.4	60.9	17.8	94.8
Kilsallagh	37.1	0.8	2.0	29.3	78.8	30.0	80.9
Knockacoller	13.3	0.0	0.0	9.2	69.2	9.2	69.2
Lisnageeragh	37.0	4.6	12.5	12.8	34.6	17.4	47.1
Lough Corrib	37.7	0.0	0.0	0.0	0.0	0.0	0.0
Lough Forbes	74.1	46.1	62.2	8.5	11.5	54.6	73.7
Lough Lurgeen	72.2	0.0	0.0	0.0	0.0	0.0	0.0
Lough Ree	158.0	1.9	1.2	0.0	0.0	1.9	1.2
Moanveanlagh	12.9	0.0	0.0	0.0	0.0	0.0	0.0
Moneybeg and Clareisland*	55.9	0.0	0.0	0.0	0.0	0.0	0.0
Mongan	14.5	8.9	61.5	5.9	40.9	14.9	102.4
Monivea*	12.9	0.0	0.0	0.0	0.0	0.0	0.0
Mouds[2]	51.8	0.1	0.1	25.2	48.7	25.3	48.8
Mount Hevey[2]	43.0	10.8	25.1	0.0	0.0	10.8	25.1
Moyclare	20.0	4.1	20.3	14.5	72.7	18.6	93.0
Raheenmore	14.6	9.6	65.9	2.1	14.6	11.8	80.5
Redwood	101.9	0.0	0.0	0.0	0.0	0.0	0.0
River Moy	130.3	0.0	0.0	0.0	0.0	0.0	0.0
Shankill West	9.0	0.0	0.0	7.1	79.4	7.1	79.4
Sharavogue	29.4	22.3	75.9	4.1	13.8	26.4	89.7
Sheheree	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tullaghanrock	15.6	0.0	0.0	0.0	0.0	0.0	0.0
Tullaher Lough	21.6	0.0	0.0	0.0	0.0	0.0	0.0
Total in SACs	2396.4	599.8	25.0	342.5	14.3	942.3	39.3

[1] Note that information on the lengths of drains blocked etc. by Coillte in the nine newest SACs is currently unavailable. These sites are: Derrinlough (Cloonkeenleanode) Bog SAC 002197, Ballygar (Aghrane) Bog SAC 002199, Aughrim (Aghrane) Bog SAC 002200, Derragh Bog SAC 002201, Mount Jessop Bog SAC 002202, Girley (Drewstown) Bog SAC 002203, Wooddown Bog SAC 002205, Scohaboy (Sopwell) Bog SAC 002206, Arragh More (Derrybreen Bog) SAC 002207.

[2] NPWS has undertaken restoration works on these eight sites since November 2024. However, the lengths of drains blocked within these sites is unavailable at this time.

Appendix 15 Lengths of drains blocked within NHAs proposed for retention

Summary of the lengths of drains blocked within each of the 36 NHAs proposed for retention during the reporting period, prior to the reporting period, overall and as measured against the total length of drains proposed to be blocked in the restoration plans. Note that in some instances, a figure of greater than 100% is given for percentage of drains blocked. This can occur where the works on the ground go beyond what was initially planned or where new drains were excavated or discovered since the plans were made in 2016.

Name of NHA	Total length of drains to be blocked (km)	Length of drains blocked pre-2019		Length of drains blocked 2019-24		Total drains blocked by November 2024	
		(km)	% of total to be blocked	(km)	% of total to be blocked	(km)	% of total to be blocked
Aghnamona Bog	69.7	0.0	0.0	0.0	0.0	0.0	0.0
Anna More Bog	16.4	0.0	0.0	0.0	0.0	0.0	0.0
Arragh More Bog	125.0	86.3	69.1	0.0	0.0	86.3	69.1
Aughrim Bog	93.5	44.1	47.2	0.0	0.0	44.1	47.2
Ayle Lower Bog	9.4	0.0	0.0	0.0	0.0	0.0	0.0
Ballygar Bog	36.6	0.0	0.0	0.0	0.0	0.0	0.0
Ballymacegan Bog	8.1	0.0	0.0	0.0	0.0	0.0	0.0
Ballynagrenia Bog	48.7	0.0	0.0	31.9	65.6	31.9	65.6
Bracklagh Bog	9.7	0.0	0.0	0.0	0.0	0.0	0.0
Cangort Bog	26.8	15.7	58.6	0.0	0.0	15.7	58.6
Carbury Bog	10.7	0.0	0.0	0.0	0.0	0.0	0.0
Carrickynaghtan Bog	18.8	0.0	0.0	0.0	0.0	0.0	0.0
Cashel Bog (Leitrim)	14.1	0.0	0.0	0.0	0.0	0.0	0.0
Castle Ffrench East	87.0	0.0	0.0	0.0	0.0	0.0	0.0
Castle Ffrench West	8.2	0.0	0.0	0.0	0.0	0.0	0.0
Cloncrow Bog	51.1	4.7	9.2	43.4	84.9	48.0	94.0
Clonydonnin Bog	16.7	0.2	1.4	7.9	47.4	8.2	48.8
Daingean Bog	4.9	0.0	0.0	4.9	99.1	4.9	99.1
Derrinlough Bog	40.7	19.9	48.9	14.4	35.3	34.3	84.2
Girley Bog	48.6	18.4	37.8	3.1	6.4	21.5	44.2
Hawkswood Bog	5.7	0.0	0.0	0.0	0.0	0.0	0.0
Keeloges Bog	18.3	0.0	0.0	0.0	0.0	0.0	0.0
Lough Derravaragh	51.1	38.6	75.6	0.0	0.0	38.6	75.6
Lough Garr	20.1	0.0	0.0	0.0	0.0	0.0	0.0
Lough Kinale and Derragh Lough	1.4	0.9	62.7	0.0	0.0	0.9	62.7
Lough Tee Bog East	11.9	0.0	0.0	0.0	0.0	0.0	0.0
Loughanilloon Bog	4.7	0.0	0.0	0.0	0.0	0.0	0.0
Milltownpass Bog	7.7	0.6	7.8	5.5	70.7	6.1	78.6

Name of NHA	Total length of drains to be blocked (km)	Length of drains blocked pre-2019		Length of drains blocked 2019-24		Total drains blocked by November 2024	
		(km)	% of total to be blocked	(km)	% of total to be blocked	(km)	% of total to be blocked
Monaincha Bog	25.3	0.0	0.0	0.0	0.0	0.0	0.0
Moorfield Bog/Farm Cottage	12.6	0.0	0.0	0.0	0.0	0.0	0.0
Mount Jessop Bog	123.4	110.9	89.9	0.0	0.0	110.9	89.9
Raford River Bog	11.1	0.0	0.0	0.0	0.0	0.0	0.0
Rinn River	3.9	0.0	0.0	0.0	0.0	0.0	0.0
River Little Brosna Callows	6.3	1.7	27.7	0.0	0.0	1.7	27.7
Scohaboy Bog	96.5	39.0	40.4	62.5	64.7	101.4	105.1
Wooddown Bog	76.1	60.4	79.3	9.1	12.0	69.5	91.3
Total in NHAs proposed for retention	1220.6	441.4	36.2	182.7	15.0	624.1	51.1

Appendix 16 Forestry that is proposed to be removed from within designated sites by restoration plans

Conifer plantations that are proposed to be removed within the current network of SACs and the 36 NHAs proposed for retention

Site Code	Site Name	Location and area (ha)
000391	Ballynafagh Bog SAC	10.8ha on high bog & 5.6ha on cutover
000592	Bellanagare Bog SAC	13.1ha on high bog & 9.6ha cutover
000595	Callow Bog SAC	2.1ha on high bog & 8.0ha cutover
002347	Camderry Bog SAC	1.1ha on cutover
000440	Lough Ree SAC (Clooncraff and Cloonlarge Bogs)	16.1ha on high bog & 13.5ha on cutover
002332	Coolrain Bog SAC	2.7ha on cutover
002110	Corliskea Bog SAC	4.2ha on high bog
002350	Curraghlehanagh Bog SAC	2.7ha on cutover
002298	River Moy SAC (Derrynabrock Bog)	4.6ha on cutover
002298	River Moy SAC (Kilgariff Bog)	6.2ha on cutover
002298	River Moy SAC (Gowlaun Bog)	10.0ha on cutover
002298	River Moy SAC (Tawnaghbeg Bog)	3.2ha on high bog
000422	Aghnamona Bog NHA	26.32ha on cutover
002338	Drumalough Bog SAC	3.0ha on cutover

Site Code	Site Name	Location and area (ha)
000647	Kilcarren-Firville Bog SAC	6.8ha on cutover
000285	Kilsallagh Bog SAC	1.1ha on cutover
000301	Lough Lurgeen Bog/Glenamaddy Turlough SAC	9.1ha on high bog & 7.5ha on cutover
002351	Moanveanlagh Bog SAC	0.9ha on cutover
002331	Mouds Bog SAC	10.4ha on cutover
002342	Mount Hevey Bog SAC	0.5ha on cutover
002354	Tullaghanrock Bog SAC	2.4ha on high bog & 1.1ha on cutover
000640	Arragh More Bog NHA	3.6ha on high bog
001244	Castle Ffrench East Bog NHA	7.8ha on high bog
000280	Castle Ffrench West Bog NHA	15.0ha on high bog & 5.7ha on cutover
001812	Lough Garr NHA	5.1ha on high bog & 0.9ha on cutover
000937	Scohaboy Bog NHA	5.3ha on cutover (Removed in 2025)
000281	Keeloges Bog NHA	12.5ha on high bog & 0.9ha on cutover
002033	Daingean Bog NHA	2.3ha on cutover
002355	Hawkswood Bog NHA	22.4ha on cutover
000307	Lough Tee Bog East NHA	6.7ha on high bog
001020	Loughanillon Bog NHA	1.9ha on high bog & 6.1ha on cutover
000221	Moorfield Bog NHA	6.6ha on high bog & 0.4ha on cutover
000422	Aghnamona Bog NHA	29.6ha on high bog
000691	Rinn River Bog NHA	0.9ha on cutover
000321	Raford River Bog NHA	2.4ha on high bog
000674	Ballynagrenia Bog NHA	5.9ha on cutover
000229	Ballygar Bog NHA	9.7ha on cutover
000235	Bracklagh Bog NHA	22.1ha on high bog & 19.0ha on cutover
000677	Cloncrow Bog (New Forest) NHA	24.4ha on high bog & 10.0ha on cutover
000333	Anna More Bog NHA	2.9ha on cutover
000993	Ayle Lower Bog NHA	2.4ha on cutover
000890	Cangort Bog NHA	16.5ha on cutover
001227	Aughrim Bog NHA	7.3ha on high bog & 1.6ha on cutover

Appendix 17 Conservation Measures ranked by site

Table showing the main Conservation Measures impacting the site during the reporting period (2019-24) listed as whether the measure is estimated to be having a Low (L), Medium (M) or High (H) influence. See Appendix 10 for description of codes.

Site Code	Bog Name	MA 13	MB 14	MC 02	MC 07	MI0 3	MI0 5	MK 03
000422	Aghnamona Bog			M				
000564	Annagh Bog			H				
002341	Ardagullion Bog		M	H	H			H
001227	Aughrim Bog		M	H	H	L		
000641	Ballyduff Bog			H	H			

Site Code	Bog Name	MA 13	MB 14	MC 02	MC 07	MI0 3	MI0 5	MK 03
000235	Bracklagh Bog			L				
002346	Brown Bog			H				
000595	Callow Bog			M				
001242	Carrownagappul Bog		M	H	H			M
001405	Cashel Bog			M				
000572	Clara Bog	L		H	H	L		M
000677	Cloncrow Bog		L	H	H	L		H
000641	Clonfinane Bog			H	H			
000216	Cloniff Bog			H				
000565	Clonydonnin Bog			H	H			
000600	Cloonchambers Bog			M				
002348	Clooneen Bog			M				
002110	Cloonfelliv Bog			H				
002298	Cloongoonagh Bog			M				
002349	Corbo Bog			M				
002110	Corliskea Bog			M				
002033	Daingean Bog			M	H			H
000604	Derrinea Bog			H				
002298	Derrynabrock Bog			M				
000575	Ferbane Bog			H	H			
000647	Firville Bog			H				
000497	Flughany Bog			M				
000679	Garriskil Bog			H	H			
001580	Girley Bog		H	H	H	M		H
002298	Gowlaun Bog			H				
000647	Kilcarren Bog			H				
002298	Kilgarriff Bog			H				
000873	Lenareagh Bog			M	H			
001812	Lough Garr Bog			H				
000307	Lough Tee Bog East			M				
000580	Mongan Bog			H	H			
000221	Moorfield Bog/Farm Cottage Bog			H				
002342	Mount Hevey Bog		H	H				
000873	Moyarwood Bog			M	H			
000581	Moyclare Bog			H	H			
000873	Paul's Lough Bog			M	H			
000582	Raheenmore Bog	L		H	H			H
000937	Scohaboy Bog		M	H	H			H
000326	Shankill West Bog			H	H			
002298	Tawnaghbeg Bog			H				
002110	Trien Bog			H				

Appendix 18 Summary of the progress of implementation of proposed hydrological restoration measures across the 55 SACs designated for ARB and the additional seven designated for DRB

SAC Code	SAC Name	Total area to be restored (ha)	Area where works completed to Nov 2024 (ha)	% of area where works completed to Nov 2024
002199	Ballygar (Aghrane) Bog	28.0	28.0	100[1]
002201	Derragh Bog	37.6	37.6	100[1]
002197	Derrinlough (Cloonkeenleananode) Bog[2]	61.10	61.10	100[1]
002200	Aughrim (Aghrane) Bog[2]	110.33	110.33	100[1]
002202	Mount Jessop Bog[2]	71.92	71.92	100[1]
002203	Girley (Drewstown) Bog[2]	32.27	32.27	100[1]
002205	Wooddown Bog[2]	49.86	49.86	100[1]
002206	Scohaboy (Sopwell) Bog[2]	71.91	71.91	100[1]
002207	Arragh More (Derrybreen) Bog[2]	90.58	90.58	100[1]
000580	Mongan Bog	146.0	144.0	98.6[4]
001242	Carrownagappul Bog	459.3	426.1	92.8[4]
000581	Moyclare Bog	104.6	95.4	91.2[4]
002341	Ardagullion Bog	110.1	100.1	90.9[4]
000597	Carrowbehy-Caher Bog	308.3	278.3	90.3[4]
000572	Clara Bog SAC	559.3	486.9	87.0[4]
000575	Ferbane Bog	147.3	126.2	85.7[4]
000006	Killyconny Bog (Cloghbally)	163.4	139.9	85.6[4]
000285	Kilsallagh Bog	276.1	235.7	85.4[6]
000585	Sharavogue Bog	188.4	159.9	84.9[4]
000582	Raheenmore Bog	167.8	139.4	83.1[4]
001818	Lough Forbes Complex	442.5	360.8	81.6[6]
002333	Knockacoller Bog	114.1	92.9	81.4
000566	All Saints Bog and Esker	296.4	235.3	79.4
000679	Garriskil Bog	324.7	251.4	77.4[4]
000296	Lisnageeragh Bog and Ballinastack Turlough	352.7	221.6	62.8[6]
000326	Shankill West Bog	125.6	70.9	56.4
002347	Camderry Bog	274.8	153.9	56.0[5]
000641	Ballyduff-Clonfinane Bog	463.7	242.3	52.3[6]
002337	Crosswood Bog	193.3	100.8	52.1
002338	Drumalough Bog	235.9	96.2	40.8[5]
002350	Curraghlehanagh Bog	289.5	60.6	20.9[5]
002331	Mouds Bog	513.8	66.5	12.9[5]

SAC Code	SAC Name	Total area to be restored (ha)	Area where works completed to Nov 2024 (ha)	% of area where works completed to Nov 2024
002342	Mount Hevey Bog	400.5	49.4	12.3[5]
002336	Carn Park Bog[3]	241.6	0.0	0.0[5]
002346	Brown Bog	69.6	0.0	0.0[5]
002356	Ardgraigue Bog	155.6	0.0	0.0[5]
000592	Bellanagare Bog[3]	1131.6	0.0	0.0
000614	Cloonshanville Bog[3]	191.1	0.0	0.0
002332	Coolrain Bog[3]	123.3	0.0	0.0
000440	Lough Ree[3]	781.9	0.0	0.0
002340	Moneybeg and Clareisland Bogs[3]	301.9	0.0	0.0
002352	Monivea Bog[3]	267.3	0.0	0.0
000391	Ballynafagh Bog	145.5	0.0	0.0
002339	Ballynamona Bog and Corkip Lough	135.2	0.0	0.0
000231	Barroughter Bog	155.0	0.0	0.0
000595	Callow Bog	517.3	0.0	0.0
000600	Cloonchambers Bog	319.6	0.0	0.0
002348	Clooneen Bog	136.4	0.0	0.0
000248	Cloonmoylan Bog	538.4	0.0	0.0
002349	Corbo Bog	211.2	0.0	0.0
002110	Corliskea-Trien-Cloonfelliv Bog	638.7	0.0	0.0
000604	Derrinea Bog	82.0	0.0	0.0
000497	Flughany Bog	211.3	0.0	0.0
000647	Kilcarren-Firville Bog	484.8	0.0	0.0
000297	Lough Corrib	379.0	0.0	0.0
000301	Lough Lurgeen Bog-Glenamaddy Turlough	836.0	0.0	0.0
000440	Moanveanlagh Bog	195.0	0.0	0.0
002353	Redwood Bog	494.6	0.0	0.0
002298	River Moy	749.5	0.0	0.0
000382	Sheheree (Ardagh) Bog	9.3	0.0	0.0
002354	Tullaghanrock Bog	80.7	0.0	0.0
002343	Tullaher Lough and Bog	343.8	0.0	0.0
Total	SACs designated for ARB	16,650.0	4,400.1	26.4
Total	SACs designated for DRB only	488.0	488.0	100.0
Total	SACs designated for ARB and/or DRB	17,138.9	4,888.1	28.5

[1] Note that in these nine sites the NPWS are currently investigating the need for enhanced restoration works. Note also that as these SACs all lie wholly within NHAs, the figures for areas where restoration works are completed are included here and under their corresponding NHA designation.

[2] Note that these seven sites are designated for DRB only.

[3] Note that on these seven sites some restoration works have been undertaken, but no full suite of works within any area/restoration zone of the site are considered completed.

[4] NPWS has updated the original restoration plans since the completion of The Living Bog LIFE project and identified further works that are considered necessary to implement on these sites.

[5]NPWS has undertaken restoration works on these eight sites since November 2024 and it is estimated that the percentage of the area where the proposed works have been completed is as follows (in May 2025): Drumalough Bog 81.8%, Carn Park 72.3%, Brown Bog 60%, Camderry Bog 57.2%, Mount Hevey Bog 51.4%, Ardgraigue Bog 37%, Curraghlehanagh Bog 33.9% and Mouds Bog 24.6%.

[6]NPWS has updated the restoration plans for these four sites since November 2024 and identified further works that are considered necessary to implement. Thus, the percentage of the area where the proposed works have been completed is as follows (in May 2025): Kilsallagh Bog 80.4%, Lough Forbes Complex 65.8%, Lisnageeragh Bog and Ballinastack Turlough 36.7% and Ballyduff/Clonfinane Bog 0%.

Appendix 19 Summary of the progress of implementation of proposed hydrological restoration measures across the NHA network proposed for retention

NHA Code	NHA Name	Total area to be restored (ha)	Area where works completed to Nov 2024 (ha)	% of area where works completed to Nov 2024
002323	Milltownpass Bog	83.0	78.7	94.8
002033	Daingean Bog	96.1	86.6	90.2
000937	Scohaboy Bog	307.4	252.8	82.2
000694	Wooddown Bog	173.7	124.5	71.7
000677	Cloncrow Bog (New Forest)	186.3	129.2	69.4
001254	Derrinlough Bog	213.0	143.1	67.2
000565	Clonydonnin Bog	119.8	72.8	60.8
001450	Mount Jessop Bog	128.6	45.6	35.5
001580	Girley Bog	136.4	39.7	29.1
000674	Ballynagrenia and Ballinderry Bog	182.1	49.6	27.2
000684	Lough Derravaragh	83.5	22.0	26.3
000640	Arragh More Bog	322.7	66.2	20.5
001227	Aughrim Bog	258.2	38.5	14.9
000229	Ballygar Bog	145.8	20.0	13.7
000890	Cangort Bog	103.5	9.1	9.6
000281	Keeloges Bog[1]	192.8	0.0	0.0
000422	Aghnamona Bog	323.4	0.0	0.0
000333	Anna More Bog	120.6	0.0	0.0
000993	Ayle Lower Bog	66.1	0.0	0.0
000642	Ballymacegan Bog	80.7	0.0	0.0
000235	Bracklagh Bog	94.6	0.0	0.0
001388	Carbury Bog	119.1	0.0	0.0
001623	Carrickynaghtan Bog	225.3	0.0	0.0
001405	Cashel Bog (Leitrim)	80.1	0.0	0.0
001244	Castle Ffrench East Bog	185.8	0.0	0.0

NHA Code	NHA Name	Total area to be restored (ha)	Area where works completed to Nov 2024 (ha)	% of area where works completed to Nov 2024
000280	Castle Ffrench West Bog	86.7	0.0	0.0
002355	Hawkswood Bog	93.4	0.0	0.0
001812	Lough Garr	201.0	0.0	0.0
000985	Lough Kinale and Derragh Lough	36.6	0.0	0.0
000307	Lough Tee Bog East	121.8	0.0	0.0
001020	Loughanilloon Bog	34.6	0.0	0.0
000652	Monaincha Bog/Ballaghmore Bog	261.0	0.0	0.0
000221	Moorfield Bog/Farm Cottage	89.0	0.0	0.0
000321	Raford River Bog	143.4	0.0	0.0
000691	Rinn River	30.8	0.0	0.0
000564	River Little Brosna Callows	48.5	0.0	0.0
Total		5,175.2	1,178.4	22.8

[1] Note that on Keeloges Bog some restoration works have been undertaken, but no works within any area/zone of the site are considered completed.

Appendix 20 Deep-peat Bord na Móna bogs where restoration works have been undertaken

Year of Restoration Works	Bog Name	County	High Bog Area (ha)	Total Site Area (ha)
2009	Abbeyleix Bog	Laois	104	190
2011	Killeglan Complex (Cuckoo Hill Bog)	Roscommon	60	145
2012	Derrydoo-Woodlough Complex (Moyarwood Bog)	Galway	171	197
2013	Clonboley Complex (Ballydangan Bog)	Roscommon	215	240
2014	Derrydoo-Woodlough Complex (Lenareagh Bog)	Galway	90	112
2014	Derrydoo-Woodlough Complex (Paul's Lough Bog)	Galway	118	132
2014	Cloonshannagh/Mostrim Bog	Roscommon	36	36
2015	Mostrim Bog (Phase1)	Longford	41	41
2015	Clonboley Complex (Cranberry Lough Bog)	Roscommon	76	98
2015	Clonboley Complex (Knock Bog)	Roscommon	129	187
2016	Bunahinly remnant	Westmeath	28	393
2016	Clera Island	Roscommon	157	179
2016	Bracklin remnant	Westmeath	19	755

Year of Restoration Works	Bog Name	County	High Bog Area (ha)	Total Site Area (ha)
2016	Clynan Bog (Phase 1)	Westmeath	10	10
2016 +	Killeglan Complex (Killeglan Bog Cluster)	Roscommon	334	440
2017	Lough Bannow remnant	Longford	33	758
2017	Clongawny More remnant	Offaly	27	1021
2017	Daingean-Rathdrum remnant	Offaly	26	368
2017	Coolnagun remnant	Westmeath	90	670
2018	Ballysorrel	Tipperary	167	196
2018	Knockahaw Bog	Tipperary / Kilkenny	312	372
2018	Glashabaun North bog remnant	Offaly	16	508
2018	Derrylea bog remnant	Offaly	64	??
Total Area	Pre-reporting period		2,323	5,728
2018-2019	Clonwhelan Bog	Longford / Westmeath	132	162
2018-2020	Newtown-Loughgore	Roscommon	340	454
2019-2021	Mostrim Bog	Longford / Westmeath	358	398
2021	Kellysgrove Bog (PCAS)	Galway	118	192
2021	Kilmacshane bog (PCAS)	Galway	26	??
2022	Glenlough Bog (PCAS)	Longford/Westmeath	262	329
2023-2024	Lisclogher West Bog (PCAS)	Westmeath	164	239
ongoing	Clynan (PCAS)	Longford / Westmeath	170	
ongoing	Tirur-Derrymore Bog Cluster (PCAS)	Galway	245	445
ongoing	Mostrim Bog (Phase 1& 2) (PCAS)	Longford / Westmeath	Not Available	Not Available
Total Area	Reporting period (2019-24)		1,815	
Total Area	To Date			
To start in late 2024	Killeglan Complex (Killeglan Bog cluster) (Phase 2 - PCAS)	Roscommon	N/A	N/A
To start in late 2024	Clonboley Complex (Cranberry Lough Bog) (Phase 2 - PCAS)	Roscommon	N/A	N/A
To start in late 2024	Clonboley Complex (Knock Bog) (Phase 2 - PCAS)	Roscommon	N/A	N/A
To start in late 2024	Clonboley Complex (Ballydangan Bog) (Phase 2 - PCAS)	Roscommon	N/A	N/A
To start in late 2024	Clonboley Complex (Tonilig Bog) (Phase 1 - PCAS)	Roscommon	N/A	N/A
To start in late 2024	Newtown-Loughgore (Phase 1 & 2 - PCAS)	Roscommon	N/A	N/A

Appendix 21 Lengths of bunding built within SACs

Summary of the lengths of trench and contour bunds built within each of the 62 raised bog SACs during the reporting period, measured against the total length of bunds proposed in the restoration plans. Note that in some instances, a figure of greater than 100% is given for percentage of bunds built. This can occur where the works on the ground go beyond what was initially planned in 2016. This can happen as the success of bunds built on sites such as Cloncrow Bog NHA has led to a reappraisal of the methods, and further opportunities for bund construction other than what was initially proposed as part of the first phase of the restoration plans is being explored on a site-by-site basis as restoration works are undertaken. Note that in the table below the sum of the trench and contour bunds constructed does not always equal the total length of bunds constructed. This is because at the time of reporting the type of bund constructed on three of the sites was unknown.

SAC Name	Proposed length of bunding (km)	Bunding Type		Length of bunding built (km)	% of proposed bunding built
		Trench	Contour		
Crosswood	16.19	0.36	0.86	1.21	7.5
All Saints	15.79	16.76	0.00	16.76	106.1
Ballynafagh	14.92	0.00	0.00	0.00	0.0
River Moy	14.07	0.00	0.00	0.00	0.0
Kilsallagh	13.20	8.97	3.37	12.34	93.5
Cloonmoylan	12.44	0.00	0.00	0.00	0.0
Ballynamona	10.95	0.00	0.00	0.00	0.0
Lough Forbes	10.91	12.20	0.00	12.20	111.8
Mount Hevey	9.94	0.00	0.00	0.00	0.0
Curraghlehanagh	9.71	4.10	4.16	8.26	85.0
Kilcarren-Firville	9.33	0.00	0.00	0.00	0.0
Flughany	8.84	0.00	0.00	0.00	0.0
Mouds	8.76	3.99	0.00	3.99	45.5
Carn Park	8.36	3.02	0.00	3.02	36.2
Corliskea/Trien/Cloonf	8.23	0.00	0.00	0.00	0.0
Drumalough	7.28	0.00	0.00	0.00	0.0
Lisnageeragh	5.95	1.55	0.00	1.55	26.1
Ballyduff/Clonfinane	5.80	0.00	0.00	0.00	0.0
Knockacoller	4.39	0.05	4.75	4.80	109.3
Barroughter	3.82	0.00	0.00	0.00	0.0
Camderry	3.49	1.40	0.14	1.54	44.1
Moneybeg and Clareisland	3.15	0.00	0.00	0.00	0.0
Killyconny	2.90	3.56	0.00	3.56	122.8
Ardgraigue	2.47	0.00	0.00	0.00	0.0
Brown	2.00	0.00	0.00	0.00	0.0
Tullaghanrock	1.49	0.00	0.00	0.00	0.0

SAC Name	Proposed length of bunding (km)	Bunding Type		Length of bunding built (km)	% of proposed bunding built
		Trench	Contour		
Carrownagappul	0.58	0.78	0.00	0.78	134.8
Ardagullion	0.51	0.00	0.00	0.50	97.1
Clara	0.20	0.18	0.00	0.18	87.5
Raheenmore	0.00	0.00	0.00	1.56	N/A
Total in SACs	215.65	56.92	13.28	72.25	33.5

Appendix 22 Lengths of bunding built within NHAs proposed for retention

Summary of the lengths of trench and contour bunds built within each of the 36 NHAs proposed for retention during the reporting period, measured against the total length of bunds proposed in the restoration plans. Note that in some instances, a figure of greater than 100% is given for percentage of bunds built. This can occur where the works on the ground go beyond what was initially planned in 2016. Note that all bunds built were constructed during the reporting period.

NHA Name	Proposed length of bunding (km)	Bunding Type		Length of bunding built (km)	% of proposed bunding built
		Trench	Contour		
Castle Ffrench East Bog	17.00	0.00	0.00	0.00	0.0
Scohaboy Bog	14.90	7.82	6.35	14.17	95.1
Cloncrow Bog	12.60	4.82	1.41	6.24	49.5
Girley Bog	8.05	1.03	1.96	2.99	37.2
Lough Kinale and Derragh Lough	4.10	0.00	0.00	0.00	0.0
Anna More Bog	3.29	0.00	0.00	0.00	0.0
Lough Garr Bog	2.44	0.00	0.00	0.00	0.0
Derrinlough Bog	2.34	3.51	7.17	10.68	456.8
River Little Brosna Callows	2.33	0.00	0.00	0.00	0.0
Ayle Lower Bog	2.15	0.00	0.00	0.00	0.0
Ballymacegan Bog	1.92	0.00	0.00	0.00	0.0
Castle Ffrench West Bog	1.90	0.00	0.00	0.00	0.0
Hawkswood Bog	1.82	0.00	0.00	0.00	0.0
Daingean Bog	1.73	1.80	0.00	1.80	104.2
Milltownpass Bog	1.21	1.97	0.00	1.97	163.5
Bracklagh Bog	1.06	0.00	0.00	0.00	0.0
Aughrim Bog	0.83	0.00	0.00	0.00	0.0
Carbury Bog	0.26	0.00	0.00	0.00	0.0
Clonydonnin Bog	0.00	0.00	0.13	0.13	N/A

NHA Name	Proposed length of bunding (km)	Bunding Type		Length of bunding built (km)	% of proposed bunding built
		Trench	Contour		
Total in NHAs	79.94	20.95	17.03	37.98	47.5

Appendix 23 CCA for Area and S&F and overall

Table showing the Conservation Condition Assessment (CCA) for area, structure and functions (S & F) and overall, of the 46 bogs where a CCA was carried out during the reporting period. Area, S&F and overall status classed against FRV as Favourable (F), Unfavourable Inadequate (UI) and Unfavourable Bad (UB). Trend classed as increasing (I), stable (S) or decreasing (D). S&F trend bases on changes in extent of central ecotope and active flush (the higher quality ecotopes)

Site Code	Bog Name	Area		S & F		Overall
		Status - Trend	ARB change (ha)	Status - Trend	C/AF change (ha)	Status - Trend
000575	Ferbane Bog	UI - I	+4.2	UB - I	+0.3	UB - I
001580	Girley Bog	UI - I	+1.9	UB - I	+0	UB - I
001242	Carrownagappul Bog	UB - I	+13.1	UB - I	+0.2	UB - I
000679	Garriskil Bog	UB - I	+8.0	UB - I	+1.5	UB - I
000326	Shankill West Bog	UB - I	+2.0	UB - I	0	UB - I
000937	Scohaboy Bog	UB - I	+3.5	UB - I	0	UB - I
000641	Ballyduff Bog	UB - I	+2.8	UB - I	+0.2	UB - I
002341	Ardagullion Bog	UB - I	+1.9	UB - I	0	UB - I
000677	Cloncrow Bog	UB - I	+1.8	UB - I	+0.1	UB - I
001227	Aughrim Bog	UB - I	+1.7	UB - I	+0.1	UB - I
000581	Moyclare Bog	UB - I	+1.2	UB - I	+0.3	UB - I
000565	Clonydonnin Bog	UB - I	+1.6	UB - I	0	UB - I
000641	Clonfinane Bog	UB - I	+0.9	UB - S	0	UB - S
000873	Lenareagh Bog	UB - I	+2.6	UB - D[1]	+0.9	UB - D
000497	Flughany Bog	UB - I	+7.3	UB - D[1]	+0.1	UB - D
000873	Moyarwood Bog	UB - I	+3.2	UB - D[1]	0	UB - D
000873	Paul's Lough Bog	UB - I	+1.0	UB - D[1]	+0.5	UB - D
001405	Cashel Bog	UB - I	+0.8	UB - D[1]	+0.4	UB - D
001812	Lough Garr Bog	UB - S	0	UB - S	0	UB - S
000604	Derrinea Bog	UB - S	0	UB - S	0	UB - S
002110	Cloonfelliv Bog	UB - S	0	UB - S	0	UB - S
002110	Trien Bog	UB - S	0	UB - S	0	UB - S
000582	Raheenmore Bog	UB - S	0	UB - S	0	UB - S
002138	Cloniff Bog	UB - S	0	UB - S	0	UB - S
000564	Annagh Bog	UB - S	0	UB - S	0	UB - S

Site Code	Bog Name	Area		S & F		Overall
		Status - Trend	ARB change (ha)	Status - Trend	C/AF change (ha)	Status - Trend
002298	Kilgarriff Bog	UB – S	0	UB - S	0	UB - S
002298	Tawnaghbeg Bog	UB – S	0	UB - S	0	UB - S
002298	Derrynabrock Bog	UB – S	0	UB - S	0	UB - S
000221	Moorfield Bog/Farm Cottage Bog	UB - S	0	UB - S	0	UB - S
002298	Cloongoonagh Bog	UB - S	0	UB - D	0	UB - D
002298	Gowlaun Bog	UB - S	0	UB - D	0	UB - D
000580	Mongan Bog	UB - S	0	UB - D	-2.4	UB - D
000422	Aghnamona Bog	UB - S	0	UB - D	0	UB - D
000235	Bracklagh Bog	UB - S	0	UB - D	0	UB - D
000600	Cloonchambers Bog	UB - S	0	UB - D	0	UB - D
002349	Corbo Bog	UB - S	0	UB - D	0	UB - D
000572	Clara Bog	UB - D	-3.7	UB - S	0	UB - D
000307	Lough Tee Bog East	UB - D	-0.3	UB - D	0	UB - D
000595	Callow Bog	UB - D	-0.9	UB - D	-0.1	UB - D
000647	Kilcarren Bog	UB - D	-1.2	UB - D	-0.1	UB - D
002348	Clooneen Bog	UB - D	-1.4	UB - D	-0.9	UB - D
000647	Firville Bog	UB - D	-1.5	UB - D	-0.5	UB - D
002033	Daingean Bog	UB - D	-1.8	UB - D	0	UB - D
002110	Corliskea Bog	UB - D	-2.6	UB - D	-1.2	UB - D
002346	Brown Bog	UB - D	-2.1	UB - D	-1.2	UB - D
002342	Mount Hevey Bog	UB - D	-4.5[2]	UB - D	-1.0[2]	UB - D

[1] The loss of supporting habitat (high bog) due to turf cutting overrides the improvement in vegetation quality brought about by the restoration works in the Derrydoo bog complex and the recovery from fire on Flughany and Cashel Bogs leading to a decreasing trend assessment for S&F on these bogs.

[2] The most recent ecotope survey in 2020 recorded losses in ARB including in central ecotope. Exact figures of the losses were difficult to estimate as the previous survey in 2000 used different methods and did not use GIS techniques. A figure of 1ha of loss of central ecotope during the reporting period is estimated here.

Appendix 24 CCA for Future Prospects

Table showing the Future Prospects (FP) for the 46 bogs where a CCA was carried out during the reporting period. FP is assessed under Area, Structure and Functions and Overall FP. FP of parameter classed as either Good (G), Poor (P) or Bad (B). Trend classed as increasing (I), stable (S) or decreasing (D). Overall FP classed against FRV as either Favourable (F), Unfavourable Inadequate (UI) or Unfavourable Bad (UB).

Site Code	Bog Name	FP Area		FP S&F		FP Overall	
		Status	Trend	Status	Trend	Status	Trend
000679	Garriskil Bog	G	I	G	I	F	I
001242	Carrownagappul Bog	G	I	P	I	UI	I
000575	Ferbane Bog	G	I	P	I	UI	I
001227	Aughrim Bog	G	I	P	I	UI	I
000581	Moyclare Bog	G	I	P	I	UI	I
000565	Clonydonnin Bog	G	I	P	I	UB	I
000677	Cloncrow Bog	G	I	P	I	UB	I
002341	Ardagullion Bog	P	I	P	I	UB	I
000326	Shankill West Bog	P	I	P	I	UI	I
001580	Girley Bog	P	I	P	I	UB	I
000937	Scohaboy Bog	P	I	P	I	UB	I
002033	Daingean Bog	P	I	P	D	UB	D
000580	Mongan Bog	P	S	P	S	UB	S
000582	Raheenmore Bog	P	S	P	S	UB	S
000873	Lenareagh Bog	P	I	B	D	UB	D
000873	Moyarwood Bog	P	I	B	D	UB	D
000873	Paul's Lough Bog	P	I	B	D	UB	D
002346	Brown Bog	P	I	P	I	UI	I
000572	Clara Bog	B	D	P	S	UB	D
001812	Lough Garr Bog	B	S	B	S	UB	S
000641	Clonfinane Bog	B	S	B	S	UB	S
002298	Kilgarriff Bog	B	S	B	S	UB	S
000641	Ballyduff Bog	B	S	B	S	UB	S
002110	Cloonfelliv Bog	B	S	B	S	UB	S
002110	Trien Bog	B	S	B	S	UB	S
002298	Tawnaghbeg Bog	B	S	B	S	UB	S
002298	Derrynabrock Bog	B	S	B	S	UB	S
002138	Cloniff Bog	B	S	B	S	UB	S
000564	Annagh Bog	B	S	B	S	UB	S
000604	Derrinea Bog	B	S	B	S	UB	S
000221	Moorfield Bog/Farm Cottage Bog	B	S	B	S	UB	S
000595	Callow Bog	B	D	B	D	UB	D
000600	Cloonchambers Bog	B	D	B	D	UB	D
002348	Clooneen Bog	B	D	B	D	UB	D
002349	Corbo Bog	B	D	B	D	UB	D
002110	Corliskea Bog	B	D	B	D	UB	D
000497	Flughany Bog	B	D	B	D	UB	D
000647	Kilcarren Bog	B	D	B	D	UB	D
000647	Firville Bog	B	D	B	D	UB	D
002342	Mount Hevey Bog	B	D	B	D	UB	D

Site Code	Bog Name	FP Area		FP S&F		FP Overall	
		Status	Trend	Status	Trend	Status	Trend
002298	Gowlaun Bog	B	D	B	D	UB	D
002298	Cloongoonagh Bog	B	D	B	D	UB	D
000307	Lough Tee Bog East	B	D	B	D	UB	D
000422	Aghnamona Bog	B	D	B	D	UB	D
000235	Bracklagh Bog	B	D	B	D	UB	D
001405	Cashel Bog	B	D	B	D	UB	D

SAC Code	SAC Name	Total area to be restored (ha)	Area where works completed to Nov 2024 (ha)	% of area where works completed to Nov 2024
002199	Ballygar (Aghrane) Bog	28.0	28.0	100[1]
002201	Derragh Bog	37.6	37.6	100[1]
002197	Derrinlough (Cloonkeenleananode) Bog[2]	61.10	61.10	100[1]
002200	Aughrim (Aghrane) Bog[2]	110.33	110.33	100[1]
002202	Mount Jessop Bog[2]	71.92	71.92	100[1]
002203	Girley (Drewstown) Bog[2]	32.27	32.27	100[1]
002205	Wooddown Bog[2]	49.86	49.86	100[1]
002206	Scohaboy (Sopwell) Bog[2]	71.91	71.91	100[1]
002207	Arragh More (Derrybreen) Bog[2]	90.58	90.58	100[1]
000580	Mongan Bog	146.0	144.0	98.6[4]
001242	Carrownagappul Bog	459.3	426.1	92.8[4]
000581	Moyclare Bog	104.6	95.4	91.2[4]
002341	Ardagullion Bog	110.1	100.1	90.9[4]
000597	Carrowbehy-Caher Bog	308.3	278.3	90.3[4]
000572	Clara Bog SAC	559.3	486.9	87.0[4]
000575	Ferbane Bog	147.3	126.2	85.7[4]
000006	Killyconny Bog (Cloghbally)	163.4	139.9	85.6[4]
000285	Kilsallagh Bog	276.1	235.7	85.4[6]
000585	Sharavogue Bog	188.4	159.9	84.9[4]
000582	Raheenmore Bog	167.8	139.4	83.1[4]
001818	Lough Forbes Complex	442.5	360.8	81.6[6]
002333	Knockacoller Bog	114.1	92.9	81.4
000566	All Saints Bog and Esker	296.4	235.3	79.4
000679	Garriskil Bog	324.7	251.4	77.4[4]
000296	Lisnageeragh Bog and Ballinastack Turlough	352.7	221.6	62.8[6]
000326	Shankill West Bog	125.6	70.9	56.4
002347	Camderry Bog	274.8	153.9	56.0[5]
000641	Ballyduff-Clonfinane Bog	463.7	242.3	52.3[6]

SAC Code	SAC Name	Total area to be restored (ha)	Area where works completed to Nov 2024 (ha)	% of area where works completed to Nov 2024
002337	Crosswood Bog	193.3	100.8	52.1
002338	Drumalough Bog	235.9	96.2	40.8[5]
002350	Curraghlehanagh Bog	289.5	60.6	20.9[5]
002331	Mouds Bog	513.8	66.5	12.9[5]
002342	Mount Hevey Bog	400.5	49.4	12.3[5]
002336	Carn Park Bog[3]	241.6	0.0	0.0[5]
002346	Brown Bog	69.6	0.0	0.0[5]
002356	Ardgraigue Bog	155.6	0.0	0.0[5]
000592	Bellanagare Bog[3]	1131.6	0.0	0.0
000614	Cloonshanville Bog[3]	191.1	0.0	0.0
002332	Coolrain Bog[3]	123.3	0.0	0.0
000440	Lough Ree[3]	781.9	0.0	0.0
002340	Moneybeg and Clareisland Bogs[3]	301.9	0.0	0.0
002352	Monivea Bog[3]	267.3	0.0	0.0
000391	Ballynafagh Bog	145.5	0.0	0.0
002339	Ballynamona Bog and Corkip Lough	135.2	0.0	0.0
000231	Barroughter Bog	155.0	0.0	0.0
000595	Callow Bog	517.3	0.0	0.0
000600	Cloonchambers Bog	319.6	0.0	0.0
002348	Clooneen Bog	136.4	0.0	0.0
000248	Cloonmoylan Bog	538.4	0.0	0.0
002349	Corbo Bog	211.2	0.0	0.0
002110	Corliskea-Trien-Cloonfelliv Bog	638.7	0.0	0.0
000604	Derrinea Bog	82.0	0.0	0.0
000497	Flughany Bog	211.3	0.0	0.0
000647	Kilcarren-Firville Bog	484.8	0.0	0.0
000297	Lough Corrib	379.0	0.0	0.0
000301	Lough Lurgeen Bog-Glenamaddy Turlough	836.0	0.0	0.0
000440	Moanveanlagh Bog	195.0	0.0	0.0
002353	Redwood Bog	494.6	0.0	0.0
002298	River Moy	749.5	0.0	0.0
000382	Sheheree (Ardagh) Bog	9.3	0.0	0.0
002354	Tullaghanrock Bog	80.7	0.0	0.0
002343	Tullaher Lough and Bog	343.8	0.0	0.0
Total	SACs designated for ARB	16,650.0	4,400.1	26.4
Total	SACs designated for DRB only	488.0	488.0	100.0
Total	SACs designated for ARB and/or DRB	17,138.9	4,888.1	28.5

[1] Note that in these nine sites the NPWS are currently investigating the need for enhanced restoration works. Note also that as these SACs all lie wholly within NHAs, the figures for areas where restoration works are completed are included here and under their corresponding NHA designation.

[2] Note that these seven sites are designated for DRB only.

[3] Note that on these seven sites some restoration works have been undertaken, but no full suite of works within any area/restoration zone of the site are considered completed.

[4] NPWS has updated the original restoration plans since the completion of The Living Bog LIFE project and identified further works that are considered necessary to implement on these sites.

[5] NPWS has undertaken restoration works on these eight sites since November 2024 and it is estimated that the percentage of the area where the proposed works have been completed is as follows (in May 2025): Drumalough Bog 81.8%, Carn Park 72.3%, Brown Bog 60%, Camderry Bog 57.2%, Mount Hevey Bog 51.4%, Ardgraigue Bog 37%, Curraghlehanagh Bog 33.9% and Mouds Bog 24.6%.

[6] NPWS has updated the restoration plans for these four sites since November 2024 and identified further works that are considered necessary to implement. Thus, the percentage of the area where the proposed works have been completed is as follows (in May 2025): Kilsallagh Bog 80.4%, Lough Forbes Complex 65.8%, Lisnageeragh Bog and Ballinastack Turlough 36.7% and Ballyduff/Clonfinane Bog 0%.

NHA Code	NHA Name	Total area to be restored (ha)	Area where works completed to Nov 2024 (ha)	% of area where works completed to Nov 2024
002323	Milltownpass Bog	83.0	78.7	94.8
002033	Daingean Bog	96.1	86.6	90.2
000937	Scohaboy Bog	307.4	252.8	82.2
000694	Wooddown Bog	173.7	124.5	71.7
000677	Cloncrow Bog (New Forest)	186.3	129.2	69.4
001254	Derrinlough Bog	213.0	143.1	67.2
000565	Clonydonnin Bog	119.8	72.8	60.8
001450	Mount Jessop Bog	128.6	45.6	35.5
001580	Girley Bog	136.4	39.7	29.1
000674	Ballynagrenia and Ballinderry Bog	182.1	49.6	27.2
000684	Lough Derravaragh	83.5	22.0	26.3
000640	Arragh More Bog	322.7	66.2	20.5
001227	Aughrim Bog	258.2	38.5	14.9
000229	Ballygar Bog	145.8	20.0	13.7
000890	Cangort Bog	103.5	9.1	9.6
000281	Keeloges Bog[1]	192.8	0.0	0.0
000422	Aghnamona Bog	323.4	0.0	0.0
000333	Anna More Bog	120.6	0.0	0.0
000993	Ayle Lower Bog	66.1	0.0	0.0
000642	Ballymacegan Bog	80.7	0.0	0.0
000235	Bracklagh Bog	94.6	0.0	0.0
001388	Carbury Bog	119.1	0.0	0.0
001623	Carrickynaghtan Bog	225.3	0.0	0.0
001405	Cashel Bog (Leitrim)	80.1	0.0	0.0
001244	Castle Ffrench East Bog	185.8	0.0	0.0
000280	Castle Ffrench West Bog	86.7	0.0	0.0
002355	Hawkswood Bog	93.4	0.0	0.0
001812	Lough Garr	201.0	0.0	0.0

NHA Code	NHA Name	Total area to be restored (ha)	Area where works completed to Nov 2024 (ha)	% of area where works completed to Nov 2024
000985	Lough Kinale and Derragh Lough	36.6	0.0	0.0
000307	Lough Tee Bog East	121.8	0.0	0.0
001020	Loughanilloon Bog	34.6	0.0	0.0
000652	Monaincha Bog/Ballaghmore Bog	261.0	0.0	0.0
000221	Moorfield Bog/Farm Cottage	89.0	0.0	0.0
000321	Raford River Bog	143.4	0.0	0.0
000691	Rinn River	30.8	0.0	0.0
000564	River Little Brosna Callows	48.5	0.0	0.0
Total		5,175.2	1,178.4	22.8

1 Note that on Keeloges Bog some restoration works have been undertaken, but no works within any area/zone of the site are considered completed.

npws.ie/



NPWS

An tSeirbhís Páirceanna
Náisiúnta agus Fiadhúlra
National Parks and Wildlife Service



Rialtas na hÉireann
Government of Ireland