



14th February 2022

Subject: Appeal FAC 822/2020 in relation to licence TFL00426019

Dear

I refer to the appeal to the Forestry Appeals Committee (FAC) in relation to the above licence issued by Department of Agriculture, Food and Marine (DAFM). The FAC established in accordance with Section 14 A (1) of the Agriculture Appeals Act 2001, as amended, has now completed an examination of the facts and evidence provided by the parties to the appeal.

Background

Licence TFL00426019 for felling and subsequent of 2.7 ha at Coollegrean, Co. Kerry, was issued by the DAFM on 20th October 2020.

Hearing

A limited agenda Oral Hearing concerning 13 appeal cases, including FAC 822/2020 relating to licence TFL00426019, of which all parties were notified, was held by the FAC in Portlaoise on 17th and 18th November 2021.

In Attendance at Oral Hearing:

FAC Members: Mr. Des Johnson (Chairperson), Mr. Seamus Neely, Mr. Donal Maguire & Mr. John Evans

Consultant Ornithologist to the FAC: Dr. Alan Fielding

Appellant /Representatives:

Applicant / Representative(s):

Department Representative(s): Mr. Kevin Collins, Mr Anthony Dunbar & Ms. Eilish Keogh
Secretariat to the FAC: Ms. Ruth Kinehan, Mr. Michael Ryan

Decision

Having regard to the evidence before it, including the licence application, processing by the DAFM, the notice of appeal, submissions made at the oral hearing, all other submissions received, the consultant ornithologist's report, and in particular the following considerations, the Forestry Appeals Committee (FAC) has decided on the 7th of February 2022 to vary the decision of the Minister regarding licence TFL00426019.

The licence pertains to the felling and replanting of an area of forest on 2.7 ha at Coollegrean, Co. Kerry. The forest is currently composed of Sitka spruce and replanting would comprise lodgepole pine. The project area is described in the Appropriate Assessment Screening report on file as having a poorly drained peat soil, the slope of the site is described as predominantly flat and sloping down in a northerly direction, and the habitat is WD4. The project is described as being located in the BREANAGH_010 subbasin (flowing northeast) and the CLYDAGH (FEALE)_010 (flowing northwest). Both Waterbodies have a GOOD status assigned to them in the 2013-18 EPA assessment period and neither waterbody is at risk. The percentage forest cover is approximately 44% and 78% respectively for the two waterbodies. The application was referred to the Kerry County Council, NPWS and Inland Fisheries Ireland (IFI) on 10th December 2019. A response was received from IFI dated 21st January 2020 raising no specific objections while making some relatively standard recommendations in relation to the proposal.

Appropriate Assessment (AA) Screening and Determination (DAFM) (17.09.2020)

The DAFM undertook and documented a screening for Appropriate Assessment (AA) dated 17th September 2020 which was completed by a consultant ecologist. It examined three European Sites together with their qualifying / special conservation interests, (one of which overlaps with the site and two others within 15km), these are;

- Blackwater River (Cork/Waterford) SAC 002170 (circa 7 km distant)
- Lower River Shannon SAC 002165 (circa 1.35 km distant)
- Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA 004161 (overlaps)

The Stacks to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA 004161 was screened in. The other two sites were screened out and the project proceeded to AA stage 2 for the screened in site. The reasons for the screening conclusions reached for each of the European sites examined are recorded / referenced in the AASD. This AA Screening and Determination report included as an Appendix 1 an In-Combination Assessment report which assesses the potential for project TFL00426019 to contribute to an in-combination impact on European sites and confirms that this was considered by the Department of Agriculture, Food & the Marine (DAFM). The In-Combination statement within the report concludes that;

'Individually, the project does not represent a source of impact on the Natura sites listed in the AA screening conclusions, or if it does, has no pathway for an effect on the site listed below.

- Lower River Shannon SAC002165
- Blackwater River (Cork/Waterford) SAC 002170

Consequently, the DAFM deems that there is no potential for the project to contribute to any effects, when considered in-combination with other plans and projects. Furthermore, it is considered that the regulatory systems in place for the approval, operations (including any permitted emissions) and monitoring of the effects of these other plans and projects are such that they will ensure they too do not cause environmental pollution or give rise to direct or indirect effects on the integrity of any Natura 2000 sites in view of those sites' conservation objectives.

Therefore, DAFM deems that this project, when considered in combination with other plans and projects, will not give rise to the possibility of an effect on the Natura sites listed above.'

Appropriate Assessment Report (AAR) dated 17.09.2020

An AAR completed by a consultant ecologist on behalf of the Minister and dated 17th September 2020 is on file. At section 1 it deals with an introduction which gives details of the project, at section 2 it sets out information relating to the Appropriate Assessment of likely effects of the proposal, at section 3 it sets out a consideration of the project individually, at section 4 it sets out Mitigation Measures required to deal with the potential for the proposed felling and reforestation project TFL00426019 to itself (i.e. individually) have an adverse effect on the integrity of the Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161) (as identified on a precautionary basis), at section 5 it deals with an Assessment of Potential Residual Impacts, and at section 6 it deals with In-Combination Effects. The In-Combination Effects element of this report contains a statement which concludes that;

'the proposed clearfelling and reforestation, with mitigation measures identified, will itself (i.e. individually) not result in any adverse effect or residual adverse effects on the integrity of Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161). There is therefore no potential for the proposed works to contribute to any cumulative adverse effects on this European site, when considered in-combination with other plans and projects.

Furthermore, it is considered that the regulatory systems in place for the approval, operations (including any permitted emissions) and monitoring of the effects of these other plans and projects are such that they will ensure they too do not give rise to adverse effects on the integrity of any European Sites.

Therefore, it is deemed that this project, when considered in combination with other plans and projects, will not give rise to any adverse effect on the integrity of any European Site.

This relates to the proposed activities under TFL00426019 only. Any subsequent forestry-related activity shall be subject to the DAFM Appropriate Assessment Procedure, including an in-combination assessment with the current proposal, prior to any future consent being granted.'

Appropriate Assessment Determination (AAD) (v.08June20) Report dated 17.09.2020

An AAD completed by a consultant ecologist on behalf of the Minister and dated 17th September 2020 is on file. In relation to the screened out European sites the AAD sets out that in concluding the AA screening,

the Minister has determined that there is no likelihood of the felling and reforestation project TFL00426019, having any significant effect, either individually or in combination with other plans or projects, on any of the following European sites, in view of the conservation objectives of the European Site. In this context, particular attention was paid to the following European Sites:

Lower River Shannon SAC 002165

- Application of the current Annex 1 Habitats Table (18/12/2019), which indicates screen out scenarios in relation to habitats listed as QIs for this European site.
- The position of the project area is ca. 1.35 km from the SAC with no hydrological linkage. Thus, no possibility of effects on QIs.

Blackwater River (Cork/Waterford) SAC 002170

- Application of the current Annex 1 Habitats Table (18/12/2019), which indicates screen out scenarios in relation to habitats listed as QIs for this European site.
- The position of the project area is ca. 7 km from the SAC with no hydrological linkage. Thus, no possibility of effects on QIs.

It also sets out that in concluding the AA screening, the Minister has determined that there is the likelihood of the proposed felling and reforestation project TFL00426019 having a significant effect, either individually or in combination with other plans and projects, on the following European Site, for the reasons described, in view of best scientific knowledge and in view of the conservation objectives of the European Site.

Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA 004161

- As the project area is located within this European site and is wholly within a Hen Harrier HLNA/Red Zone, there exists the potential for impacts.

The Appropriate Assessment Determination report in section 3 at page 3 sets out that the Minister determined that an Appropriate Assessment of the activity proposed under TFL00426019 was required in relation to the above 'screened in' European site. For this reason, acting on behalf of the DAFM, compiled an Appropriate Assessment Report (completed 17th September 2020) in order to assess the significant effects and implications of the project, individually or in combination with other plans or projects, on the aforementioned European Site, and to determine if the significant effects and implications identified would have an adverse effect on the integrity of any of the abovementioned European Site identified, in view of its conservation objectives, and to identify and/or assess mitigation measures needed to avoid or eliminate the risk of such effects or implications.

In undertaking the Appropriate Assessment of the likely significant implications and effects of the activity on European Sites, the following were considered:

- The initial application TFL00426019, including all information submitted by the applicant, information available via iFORIS (including its GIS Map Viewer), responses from referral bodies and submissions from third parties;
- any subsequent supporting documentation received from the applicant;

- any other plan or project that may, in combination with the plan or project under consideration, adversely affect the integrity of a European Site;
- any written submission or observation made by a consultation body or the public to the Minister in relation to the application. Referral letters were submitted to National Parks and Wildlife Service (NPWS) and South West Regional Fisheries Board (IFI), and a letter confirming the TFL application was sent to Kerry County Council, on 10th December 2019. A response was received from IFI on 22nd January 2020 with no objections to the felling, but with recommendations related to silt control, ground stability and watercourse crossing. IFI also requested that the IFI Limerick office be contacted at least one month prior to the commencement of works.

The AAD report at section 4 (pages 3 & 4) sets out the Appropriate Assessment Determination and the mitigations required which are to be attached as conditions to any licence issued for the project. In concluding the AAD report sets out that,

'The basis for this AA Determination is as follows:

- *The identified mitigation, based on the established protocol agreed with by National Parks & Wildlife Service, will avoid adverse effect as it eliminates, during the prescribed period related to the Hen Harrier breeding season, the potential for disturbance operations associated with this project on Hen Harrier within the Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA*

Therefore, the Minister for Agriculture, Food & the Marine has determined, pursuant to Regulation 42(16) of the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) and Regulation 19(5) of the Forestry Regulations 2017 (as amended), based on objective information, that no reasonable scientific doubt remains as to the absence of any adverse effect on the integrity of any European site.'

The Licence

The licence Issued on 20th October 2020. It is subject to 16 conditions (1-5 + a-k). These include those conditions which were set out as mitigation in the AAD (condition j), and the following in relation to hen harrier (condition h);

'(h) The proposed felling site lies within a red (breeding zone) for Hen harrier. As set out in the Forest Service document "Procedures regarding disturbance operations and Hen Harrier SPAs", specific procedures, agreed with National Parks and Wildlife Service, apply to disturbance operations within SPAs designated for Hen Harrier. Disturbance operations include:

- *timber felling (thinning, tending)*
- *timber extraction to roadside*
- *timber loading at roadside*
- *mechanical cultivation for both afforestation and reforestation*
- *forest road construction (and associated developments)*
- *the driving of fencing posts*
- *any other operation(s) the Forest Service may deem as creating disturbance.*

Regarding sites within or partially within a Red Zone, no disturbance operation(s) associated with the licence is to take place during the Hen Harrier breeding season (1st April to 15th August, inclusive). To do so will lead to the immediate cancellation of the licence (where trees remain standing) and may represent an offence under the Birds and Habitats Regulations 2011. If you intend to undertake any timber felling and associated disturbance operation(s) during the Hen Harrier breeding season within a licenced site within or partially within a Red Zone, a new felling licence application must be submitted in relation to the site, together with a survey report setting out the results of a required habitat or breeding survey, as set out in the Forest Service document "Procedures regarding disturbance operations and Hen Harrier SPAs". The application will then be subjected to the Forest Service Appropriate Assessment Procedure before a decision is taken on issuing a new felling licence.'

The Appeal and Statement of Facts

There is a single appeal against the decision to grant the licence. The grounds of appeal (in summary) are as follows:

1. The appellant had limited access to the application documents contrary to requirements of the EIA Directive and the Aarhus Convention. The decision does not meet with the standards and requirements for public participation as is legally required.
2. The appellant was unable to make a precise and targeted submission identifying any defects in the application procedure. In the absence of relevant information, the appellant contends that the proposed development is likely to impact on foraging, roosting or nesting of protected species in an SPA site, is likely to impact on water quality through discharge of silt, is likely to have significant impacts on the environment, including on biodiversity, is likely to cause disturbance to strictly protected species, including otter and bats, is likely to damage the nesting and roosting sites of bats, and is likely to have cumulative effects on the environment and on protected sites in combination with other felling, planting and development activities.
3. The appeal fee is prohibitively expensive.
4. It is not clear if the original application was ever subject to a proper or adequate EIA or AA, or if the cumulative impacts and effects of this crop was ever properly assessed. Arguably, there are implications for remedial assessment and remediation of the site. If deforestation is proposed, further screening for EIA may arise. Regardless, the initial afforestation is being materially altered due to felling and, as such, the proposed development falls within the EIA Directive.
5. The Forestry (Miscellaneous Provisions) Act 2020 does not adequately or correctly transpose the EIA Directive, either for screening or conduct of EIA by the FAC.
6. Clearfelling can cause disturbance to nesting Hen Harrier, as outlined by the NPWS. Any nest disturbance can be of grave significance. Forestry has been shown to have a significant impact on the breeding success and productivity of this species by reducing and fragmenting the area of available foraging habitat. A full Appropriate Assessment should have been undertaken and should have been subject to public participation. (The section on Merlin does not quote this application reference but does quote other application numbers).
7. The decision should have been considered in the context of Articles 4, 5 and 9 of the Birds Directive, Articles 12-16 of the Habitats Directive, Article 4 of the Water Framework Directive, and climate impacts.

8. The licence should be refused in order to prevent adverse impacts on the integrity of the SPA, or the risk of adverse impacts. The population of Hen Harrier needs to be considered, and reference is made to the 2015 National Survey of Breeding Hen Harriers in Ireland. There is a risk of an adverse effect on the integrity of the SPA resulting from loss of foraging area/loss of roosting area/loss of nesting area (as appropriate) in particular.

The DAFM in its statement to the FAC responded to the written grounds as follows (in summary):

1. It is open to any person to make a submission during the public consultation process, after which they receive a copy of the decision and, if requested, a copy of the file. The appellant was free to make such a submission at the time.
2. The administration of the appeals system, including fees, is a matter for the FAC. The FAC carries out its functions in an independent and impartial manner in respect of the appeal process, as required by Irish law.
3. Operational activities of clearfelling and replanting an already established forestry area are not categorised under Annex II of the EIA Directive. There is no change of use or extension of an earlier authorisation for the project within the meaning of the EIA Directive, as future felling and replanting would have been envisioned and accounted for at the time of the forest's establishment as one of the main cyclical management options going forward.
4. The appeal site is located within the Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA 004161. DAFM's procedures regarding disturbance operations within SPAs designated for breeding Hen Harriers are set out in Appendix 21 of the Forestry Standards Manual (November 2015). This appendix states the following: "Specific procedures apply in relation to applications for consent / grant approval / licences involving certain forestry operations which have the potential to disturb Hen Harrier breeding activity within and surrounding SPAs designated for breeding Hen Harrier. These procedures, agreed with National Parks & Wildlife Service (NPWS), focus on disturbance operations within so-called 'Red Areas' during the Hen Harrier breeding season, 1st April to 15th August, inclusive." In addition to this initial input, NPWS have provided updated High Likelihood of Nesting Area (HLNA) layers to the DAFM, for it to update the information underpinning its implementation of the procedure. In recent years, this has incorporated data from the Hen Harrier EIP project. The Hen Harrier disturbance operations procedure is operated by DAFM with the agreement of NPWS. In the case of granted licence TFL00426019, a specific mitigation was included as part of the AA determination carried out by DAFM in respect of the project, as follows: *'The site of this project overlaps with a HLNA/Red Zone relating to Hen Harrier (see Appendix 1.2), the special conservation interest of the Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA 004161. Therefore, no potential disturbance operation(s) associated with this project shall take place during the Hen Harrier breeding, season (1st April to 15th August, inclusive). To do so will lead to the immediate cancellation of this licence, TFL00426019, and may represent an offence under the Birds & Habitats Regulations (2011) (S.I.477/2011).'*

5. The licenced felling and reforestation project TFL00426019 is located within the boundary of the Stacks to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA IE0004161. Merlin is not a Special Conservation Interest of this SPA, and such, does not feature in the AAD.
6. The Felling Licence application information submitted by the applicant in the form of maps (GIS and softcopy), harvesting and establishment operational procedures, were considered by DAFM in respect of felling and reforestation project subsequently licenced as TFL00426019. An in-combination report, including both forestry and non-forestry projects in the vicinity of the project area was considered. The proposed development, when considered with other plans and projects, will not give rise to any adverse effect on the integrity of any European site.
7. Appropriate Assessment screening was carried out based on European sites within a 15km radius of the project area, and sites beyond that and hydrologically connected. Specific mitigation measures set out in the Appropriate Assessment Determination (AAD) ensure that the proposed development will not result in any adverse effect on any European site. The conditions of the licence are consistent with best forest practice, national forest policy, and protection of the environment.
8. In respect of the Water framework Directive (WFD), the DAFM applies a wide range of checks and balances in its evaluation. The licence is conditional on adherence to the Interim Standards for Felling and Reforestation (DAFM 2019).

Correspondence subsequent to submission of appeal

On receipt of the appeal, the FAC provided the appellant with copies of all information that had been provided to it by the DAFM in accordance with section 7(2) of the Forestry Appeals Committee Regulations of 2020 (SI 418/ 2020). Subsequently, the appellant submitted 2 no letters (submissions) both dated the 5th July 2021. The first submission is a 35-page document and the second which has additional content (at section 12.4 on pages 19, 20 and 21) is a 37-page document. The FAC understands that the appellant has indicated that the second submission (ie the 37-page document) supersedes the first. In the particular circumstances of this appeal, the FAC decided to accept and consider the second submission, which is an expansion of the original appeal. The FAC notes that this 37-page submission from the appellant was forwarded to the DAFM, Kerry County Council, National Parks and Wildlife Service (NPWS), Inland Fisheries Ireland (IFI) and the applicant on 10th November 2021 in advance of the oral hearing and that no specific written response has been received arising from this circulation.

The appellant's expansion (in summary) included the following:

1. That the FAC procedure is unlawful and invalid, that the application is determined by the Minister and that the FAC is made up of members of the Minister's staff who are answerable to the Minister, that the criteria against which the Minister may grant a licence are not adequately set out in legislation, that the public consultation process is inadequate notwithstanding the submission of NIS and screening documents, that failure to make all information available free of charge and as soon as it becomes available is a breach of Article 6(6) of the Aarhus Convention and that failure to make information relating to the application and determination available for

inspection online breaches Article 7 of Directive 2003/4 on access to information on the environment. (The FAC understands that a NIS has not been submitted in this case).

2. That the FAC is an Administrative Decision Maker particularly consequent on its ability to substitute its decision for that of the Minister, and/or vary, set-aside or re-affirm etc. It submits that the FAC has not complied with appropriate notification and participatory obligations as required by the Aarhus Convention and that it falls to the FAC to conduct, inter alia, matters such as Appropriate Assessment under article 6(3) of the Habitats Directive and Article 4 of the Water Framework Directive, and to ensure the adequacy of compliance with a system of strict protection required under Articles 12-16 in respect of species listed under Annex IVa of the Habitats Directive and other obligations arising from EU law.
3. The submission has content headed 'Nature of Appropriate Assessment' which has as a closing piece the following;
'To be clear, it is . . . contention that in respect of the standard set out in Kelly v An Bord Pleanála, and case law cited therein,
 - a) *The materials before the FAC do not evidence that the Minister's decision achieved such a standard;*
 - b) *The materials before the FAC do not provide the FAC with the basis on which it can safely determine there will be no adverse impacts on the integrity of the Natura 2000 sites at issues consequent on this felling and reforestation plan at the centre of the licencing decision.'*
4. The submission has content headed 'Hen Harrier and potential remedial assessment obligations' which acknowledges that the situation in respect of forestry in sites designated for Hen Harrier is a complex one and references that it has been compounded by Irelands delayed implementation of certain of Obligations under a number of EU Directives and then goes on to cite these. This section of the submission paragraphs towards its end that sets out '*generalised obligations*' which it states fall to the FAC in respect of the licence in the context of the legacy issue, and indeed very particularly apply in the context of any residual impact assessment screening and impact assessment.
5. The submission also raises certain specific issues relating to Hen Harrier in relation to the Statutory Instrument designating the Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA and the timing of its signing, that there is no programme of measures for the protection of the site as required by Article 6(1) of the Habitats Directive and Article 26(5) of the Habitats Regulations 2011, that screening has therefore been carried out without regard to a programme of measures, and is incomplete for this reason. It also states that the Conservation objectives specified for the site are generic in nature, that the site is designated for Hen Harrier, that the documents designating the site do not establish whether the hen harrier are to be maintained at an existing favourable conservation status or are to be restored to favourable conservation status. It goes on to raise concerns with content within SI 591/2012 and provides some related detail. It also states that there is no basis on which to determine the sensitivity of the site to the proposed activity.
6. The submission raises concerns in relation to the Appropriate Assessment process undertaken for this proposal making reference to some of the responses relating to Hen Harrier in the Inspectors Report and states that the duty falls to the FAC as the competent authority in the context of this

- appeal to conduct the Appropriate Assessment, and to adequately and properly specify any mitigation.
7. There are a number of references to and some quotations from a NIS in the appellant's submission. (As alluded to earlier it is the FACs understanding that a NIS has not been submitted in this case).
 8. The submission references that there is a significant body of expert opinion highlighting concern on forestry for Hen Harrier in particular, and concern on pre-thicket second rotation forestry as a nesting habitat for Hen Harriers. It also references a peer reviewed paper as particularly highlighted for the FAC. It states that this paper identifies an elevated rate of nest loss and a negative area-specific relationship between breeding success of Hen Harriers and second-rotation pre-thicket forests.
 9. The submission includes a section on Survey data which it states that the stark facts on the status of Hen Harriers are evident from the consecutive national surveys conducted for Hen Harriers, in 2010 and 2015 national surveys demonstrate the decline in the species. The submission submits that further consideration should be given to the most recent survey data which shows a continued decline.
 10. The submission contains a section headed 'incorrect screening out of the Lower River Shannon SAC' and goes on to set out some detail in that respect including a submission that the site is within circa 50 metres of the nearest drain which connects with the SAC.
 11. The submission also contains sections on soil type, lacunae in the data, cumulative assessment, SEA of Forest service Guidelines all of which have been considered by the FAC.

Oral Hearing

The FAC convened a limited agenda Oral Hearing in Portlaoise on 17th and 18th November 2021 concerning 13 appeal cases, including FAC 822/2020 relating to licence TFL00426019. Representatives from DAFM, (applicants), (representing (applicant), (representing applicant for TFL 00150218) and (representing applicant), and (appellant) attended and participated. Referral bodies (County Council, Inland Fisheries Ireland (IFI), and the National Parks and Wildlife Service (NPWS)) were notified but did not attend. The Oral Hearing had a limited, specified agenda relating to the protection of the Hen Harrier and the Merlin. The FAC engaged a consultant ornithologist to advise it, and he attended and participated at the Oral Hearing, and subsequently submitted a report containing advice sought in accordance with a brief provided by the FAC. Copies of Oral Hearing notifications, introduction and agenda, the consultant's brief, and submissions made by the parties at the Oral Hearing are contained on file.

Consideration by the FAC - Assessment of grounds of appeal – *ornithological*

In addressing the grounds of appeal, the FAC firstly considered the ground of appeal contending that the licence should be refused in order to prevent disturbance to Hen Harriers resulting in adverse impacts on the integrity of the SPA within which the project lands lie, or the risk of adverse impacts. The FAC considered that the project area in this case overlaps with Stacks to Mullaghareirk Mountains, West

Limerick Hills and Mount Eagle SPA and that Special Conservation Interests of this European site are *Circus cyaneus* (Hen Harrier, permanent [breeding & wintering]) [A082]. The appellant contends that the population of Hen Harrier needs to be considered, and they refer to the 2015 National Survey of Breeding Hen Harriers in Ireland, and that there is a risk of an adverse effect on the integrity of the SPA resulting from loss of foraging area/loss of roosting area/loss of nesting area (as appropriate) in particular. The appellant's representatives expanded this ground at the Oral Hearing through an illustrated submission by [redacted], ornithologist. In addressing the issue of 'favourable conservation status' (FCS) he referred to Article 1 of the Habitats Directive and noted that EC Guidance stated that principles underpinning FCS are equally applicable in relation to the objectives of the Birds Directive. Conservation status, he stated, is favourable when population dynamics data indicate that a species is maintaining itself on a long-term basis as a viable component of its natural habitats, and the natural range is neither being reduced nor is likely to be reduced for the foreseeable future. Referencing that a species must be able to maintain itself without human intervention he referred to Favourable Reference Values (viability) and noted that no FRVs exist for Hen Harrier or Merlin in Ireland. He cited that records from 17 counties indicate that there were 300 breeding pairs of Hen Harrier 50 years ago and that this reduced to 108-157 breeding pairs in 2015. He indicated that the Hen Harrier does not appear to be self-sustaining, with a 52% decline in breeding pairs over the last 40 years and that there is now a greater proportion of Hen Harriers outside the designated Special Protection Areas (SPAs), and this, he contends, ultimately means that the requirements of the Birds Directive are not being met in relation to the protection of the Hen Harrier. Conservation Objectives for the six breeding Hen Harrier SPAs designated in 2005 have not been progressed. Stating that the natural range of the Hen Harrier has reduced, and a population trend decline of 28.6% is unfavourable he referenced that second rotation pre-thicket forestry is associated with low levels of breeding success for Hen Harrier. The submission addressed landscape scale interactions with forestry on Hen Harrier conservation, with reference to wind turbines, intensively managed agricultural land, disturbed peat, and forestry greater than 13 years old. [redacted] illustrated areas unsuitable for Hen Harrier due to cumulative impact. The submission addressed potentially suitable areas and referred to case studies of Hen Harrier in the South Stacks Complex, Slieve Aughty Mountains, the Slieve Bloom Mountains, the Slievefelim to Silvermines Mountains, and Duhallow. The case study for the South Stacks Complex, he stated, revealed that there were 26 Hen Harrier territories in the study area between 1998 and 2001, but this was reduced to 8 Hen Harrier territories in 2010. [redacted] referred to inconsistencies in the Forestry Service AA procedures. Ordinarily, forestry activities in Ireland have a 52-week window and are exempt from Sections 22 and 40 of the Wildlife Acts. He stated that there is no general system in place for the protection of birds during ordinary forestry operations and that Hen Harrier breeding success can decrease noticeably when the percentage of 2nd rotation pre-thicket forest in the landscape is >10%. He contended that the Forest Service does not provide data on the percentage of pre-thicket forestry in the landscape, that the draft Hen Harrier Response Plan includes commitments to long term forest reduction and management strategy, and that it is not clear how forestry licences can be approved in light of these commitments. He stated that there are no site-specific objectives for Hen Harrier SPAs and, as such, the requirements of Article 6(3) of the Habitats Directive cannot be met. Due to known negative effects of forestry on Hen Harrier in SPAs, it is not envisaged, he contended, that any future approvals for re-planting or afforestation in SPAs can be compliant with the Habitats Directive. He

further contended that there are no procedures in place to avoid the afforestation of important winter roosts. Hr stated that cumulative impacts of licensed activities must be considered.

The FAC engaged Dr Alan Fielding, consultant ornithologist, to provide opinion in respect of conditions attached to the appealed licences as to their adequacy to avoid impact on Hen Harriers and Merlin in terms of habitat loss, damage to nest sites, or direct mortality, to such an extent as would be likely to prevent the achievement of favourable conservation status of these species. The consultant was also asked if there is any scientific basis for the temporal and spatial parameters attached to the conditions and is there any known scientific basis for varying these parameters. Dr Fielding attended and participated at the Oral Hearing held on 17th and 18th November and had access to the full file.

Dr Fielding's report, dated 2nd December 2021, addresses the ornithological issues raised by the appellant in both the written grounds of appeal and submissions made at the Oral Hearing. It also references and considers relevant studies carried out in Ireland and the UK before reaching the following opinions:

- The felling and replanting conditions, amended to include a temporal restriction for Hen Harriers to be extended to begin on 1st March, are unlikely to have a negative effect on the current conservation status of Hen Harriers in the SPAs,
- The felling and replanting conditions, as currently specified, are unlikely to have negative effects on the current conservation status of Merlin in the SPAs,
- There is scientific basis for the temporal and spatial parameters attached to the conditions, but to remove any element of potential disturbance, the temporal restriction for Hen Harriers should be extended to begin on March 1st.

The Fielding report addresses the timing of operations, distance restrictions, Green and Red Hen Harrier areas, and re-afforestation in respect of the thirteen appealed cases. Additional context is provided in sections relating Hen Harriers and forests, and Favourable Conservation Status. Addressing the timing of operations, the Fielding report states that the felling licence conditions restricting operations between 1st April to 15th August fit with the peak period of nest activity, but operations in March have the potential to prevent Hen Harriers from selecting nest sites that could be close to the proposed forest operations. Starting felling operations prior to April 1st could lead to a relatively small change in a nest location but it also has the potential to displace the birds over much greater distances, including to a new location outside the SPA. In Scotland, NatureScot have defined the Hen Harrier breeding season as **March to mid-August inclusive**. The report suggests that the current Hen Harrier breeding season restriction of April 1st to mid-August should be extended to 1st March to August 15th. The FAC noted that _____, on behalf of the appellant, contended that the egg laying period is the most vulnerable to disturbance. The applicants raised the possibility of reducing the period back to 1st August, but the FAC finds no objective basis for such a change. Based on the information before it, the FAC concludes that conditions imposed to restrict operations during the Hen Harrier breeding season should refer to the period 1st March to 15th August for the reasons set out in the Fielding report.

The Fielding report refers to several studies of disturbance distances for Hen Harriers, and notes that these vary. The report states that felling licence distance constraint for Hen Harriers is implicit in the

definition of Red Areas (as set out in Appendix 21 of the Forestry Standards Manual (2015)), and historic nest sites are buffered to 1,200m. As such, the maximum distance to the edge of a planned forest operation, before a licence condition becomes applicable, would be 600m. This is within the normal range of suggested working distances and the report states that there is no need to change this as long as the definition of Red Areas is robust. The FAC noted that a paper prepared by the Irish Raptor Study Group Hen Harrier Conservation & Forestry Sector in Ireland, 2015 concluded that Forest Service Red Areas are a positive way of minimising the risk of nest failures due to forestry related activities within the SPAs, and that, at the Oral Hearing, the appellant's representatives considered this to be correct, subject to adequate compliance being operated. The Fielding report examines the issue of Green and Red Hen Harrier areas, noting that Hen Harriers can breed in close proximity to each other and often have overlapping foraging ranges. The report assumes that, given the loose colonial nature of many Hen Harrier nesting attempts, combined with a tendency to nest in the same general areas between years but not the same exact location, this would result in overlapping buffers rather than isolated 1.2km buffers. This was confirmed in a verbal response by DAFM. The report states that it is reasonable to assume that likely nesting locations are included within the Red zones (High Likelihood Nesting Area). It concludes that the use of Hen Harrier Red zones appears suitably robust. Based on the information before it, the FAC agrees with the conclusion of the Fielding report on this issue that the current separation distance, as required in licence conditions for Hen Harriers, should be retained.

Addressing re-forestation, the Fielding report states that this can provide for new open areas and water course setbacks, and these are potentially new foraging strips. The largest concern about re-forestation, excluding the continuing loss of previous open habitat, appears to relate to effects of second rotation pre-thicket forest on Hen Harrier productivity and survival. The Fielding report concludes that the evidence for a definitive and causal relationship between the extent of second rotation pre-thicket forest and reduced Hen Harrier breeding success is weak.

The proposed development project lands overlaps with Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA IE0004161. The Special Conservations Interests of this European site are *Circus cyaneus* (Hen Harrier, permanent [breeding & wintering]) [A082]. The proposal is for the felling of 2.7 ha of mature conifer forestry, and for its restocking. The DAFM carried out a Stage 2 Appropriate Assessment in respect of the Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA IE0004161, before recommending mitigation measures to include controls relevant to the Hen Harrier.

Against this background, the FAC considered if the licensed development was likely to have a significant effect, either individually or in combination with other plans or projects, on the SPA, prejudicing the achievement of the conservation objective for this Natura 2000 site. The FAC noted that the appellant's representative's contention generally that the Hen Harrier does not currently have favourable conservation status as the population does not appear to be self-sustaining with a decline in breeding pairs, and also to the views contained in the Fielding report in respect of these issues. The FAC considered that the conclusions reached in the Fielding report in respect of the questions put in the brief provided, were based on a detailed examination of scientific information contained in Irish and UK studies, and are

soundly based. The FAC accepted the conclusions reached, including the extension of the temporal restriction for Hen Harriers to begin on March 1st. The FAC examined the extent, type and level of maturity of existing forestry in the area, together with the characteristics of the wider landscape, and concluded that, subject to an extension of the temporal restriction to 1st March, the proposed development individually, or in combination with other plans or projects would not have an adverse impact on the integrity of the Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA IE0004161, having regard to the special conservation interest and conservation objective for the site. There is no information before the FAC to indicate that the proposed clear felling and restocking would have any significant impact on other wild bird species.

Consideration by the FAC - Assessment of grounds of appeal – *administrative*

The appellant contended that they had limited access to the application documents contrary to requirements of the EIA Directive and the Aarhus Convention, and that the decision does not meet with the standards and requirements for public participation as is legally required. They further submit that they were unable to make a precise and targeted submission identifying any defects in the application procedure, and that, in the absence of relevant information, they conclude that the proposed development is likely to impact on foraging, roosting or nesting of protected species in an SPA site. The DAFM reject this contention, stating that the right to participate was available at the application stage and that the appellant did not avail of that right. The FAC notes that the appellant lodged written grounds of appeal, and also attended and participated fully in the Oral Hearing. Based on the information before it, the FAC concludes that the DAFM decision was made in line with fair procedures and that the appellant availed of their right to participate in the appeal process.

In its letter expanding on the original appeal grounds, the appellant contends variously that the procedures of the FAC are unlawful and invalid for reasons of public participation and public access to information on the environment. The appellant did not make a submission to the DAFM as part of the licensing process. The FAC notes that, having submitted their grounds of appeal, the appellant was provided with the material provided to the FAC by the DAFM which informed the granting of the licence, and that this material in turn informed the appellant's expansion of their grounds of appeal. For these reasons and the reasons outlined in the previous paragraph the FAC does not consider that the appellant was disadvantaged or had inadequate access to information required for the submission of an appeal.

The appellant contends that the composition of the FAC renders the procedures of the FAC unlawful on the basis that the FAC is made up of members of the Minister's staff who are answerable to the Minister. The FAC concludes that there is no basis for this contention. The FAC is independent and impartial in the performance of its functions, as required by legislation.

The appellant submits that the FAC is an Administrative Decision Maker; and has not complied with appropriate notification and participatory obligations as required by the Aarhus Convention; and that it falls to the FAC to conduct inter alia matters such as Appropriate Assessment under article 6(3) of the Habitats Directive and Article 4 of the Water Framework Directive and other obligations arising from EU

law. The FAC's consideration of this appeal is in accordance with the provisions of the Forestry (Miscellaneous Provisions) Act, 2020, and the FAC's determination of this appeal is made in accordance with Section 14B(13) of the Act.

Consideration by the FAC - Assessment of grounds of appeal – other

The FAC considered the appellant's contention that the proposed development should have been addressed in the context of the EIA Directive. The EU Directive sets out, in Annex I a list of projects for which EIA is mandatory. Annex II contains a list of projects for which member states must determine through thresholds or on a case-by-case basis (or both) whether or not EIA is required. Neither afforestation nor deforestation (nor clear-felling) are referred to in Annex I. Annex II contains a class of project specified as "initial afforestation and deforestation for the purpose of conversion to another type of land use". (Class 1 (d) of Annex II). The Irish Regulations, in relation to forestry licence applications, require the compliance with the EIA process for applications relating to afforestation involving an area of more than 50 Hectares, the construction of a forest road of a length greater than 2000 metres and any afforestation or forest road below the specified parameters where the Minister considers such development would be likely to have significant effects on the environment. The FAC noted that the answer to question 3 on the form headed 'Assessment to Determine EIA Requirement' in the inspector's certification indicates that this application, together with existing thinning and or clearfelling of 3 years or less within a 500 metre radius, constitute an area of 4.22 ha and that the same inspectors report at question 42 records that this application should not be subject to the EIA process. The FAC also notes that there is a 'yes' answer recorded at question 7 indicating that, based on the extent of licenced and recommended thinning and or clearfelling within 500 m within three years or less, the cumulative effect of this application is likely to have a significant impact. The FAC considered this and having regard to the scale of the proposal (2.7 ha) and the extent of licenced / recommended approvals for thinning and or clearfell within 500 m within the previous three years or less at the time the licence was approved, concluded that this proposal would not lead to a significance of cumulative effect such that required the carrying out of an EIA. The FAC also concluded that this proposal being for felling and subsequent replanting, as part of a forestry operation, with no change in land use, does not fall within the classes referred to in the Directive, and similarly is not covered in the Irish Regulations. Furthermore, the proposed development does not include any works which, by themselves, would fall within a class covered by the Directive. In considering Class 13(a) of Annex II of the Directive, the FAC found no convincing reason to conclude that the proposed development would constitute "any change or extension of a project listed in Annex I, or this Annex, already authorised, executed or in the process of being executed, which may have significant adverse effects on the environment", as there would be no change or extension to the existing commercial forestry project which may have significant effects on the environment. As such, the FAC concluded that there is no breach of any of the provisions of the EIA Directive.

The appellant contends that an assessment should be made of climate impacts arising from the proposed development but does not submit specific views in respect of potential impacts. Climate impacts could potentially arise from the proposed development in terms of carbon sequestration and also carbon release and, as referred to in the Fielding report, may have wider implications for foraging of Hen Harriers

by impacting on the availability of prey. Having regard to the nature and scale of the proposed development, which includes both felling and restocking, and based on the information before it, the FAC finds no reason to conclude that any significant or serious error was made in the making of the decision to grant the licence in respect of this issue.

The FAC considered the grounds of appeal relating to the Habitats Directive and related matters and considered the procedures undertaken by the DAFM in respect of the provisions of the Habitats Directive. The DAFM AAD, completed by a consultant ecologist on behalf of the Minister and dated 17th September 2020, is on file and deals with the screened in site (Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA 004161) as identified in the DAFM's AAS report. It sets out that as the project area is located within this European site and is wholly within a Hen Harrier HLNA/Red Zone, there exists the potential for impacts. The Appropriate Assessment Determination report in section 3 at page 3 sets out that the Minister determined that an Appropriate Assessment of the activity proposed under TFL00426019 was required in relation to the above 'screened in' European site. For this reason, *[redacted]*, acting on behalf of the DAFM, compiled an Appropriate Assessment Report (completed 17/09/2020) in order to assess the significant effects and implications of the project, individually or in combination with other plans or projects, on the aforementioned European Site, and to determine if the significant effects and implications identified would have an adverse effect on the integrity of the abovementioned European Site identified, in view of its conservation objectives, and to identify and/or assess mitigation measures needed to avoid or eliminate the risk of such effects or implications.

The FAC noted that in undertaking the Appropriate Assessment of the likely significant implications and effects of the activity on European Sites, the following were considered:

- The initial application TFL00426019, including all information submitted by the applicant, information available via iFORIS (including its GIS Map Viewer), responses from referral bodies and submissions from third parties;
- any subsequent supporting documentation received from the applicant;
- any other plan or project that may, in combination with the plan or project under consideration, adversely affect the integrity of a European Site;
- any written submission or observation made by a consultation body or the public to the Minister in relation to the application. Referral letters were submitted to National Parks and Wildlife Service (NPWS) and South West Regional Fisheries Board (IFI), and a letter confirming the TFL application was sent to Kerry County Council, on 10/12/2019. A response was received from IFI on 22/01/2020 with no objections to the felling, but with recommendations related to silt control, ground stability and watercourse crossing. IFI also requested that the IFI Limerick office be contacted at least one month prior to the commencement of works.

The AAD report at section 4 (pages 3 & 4) sets out the Appropriate Assessment Determination and the mitigations required which are to be attached as conditions to any licence issued for the project. In concluding the AAD report sets out that,

'The basis for this AA Determination is as follows:

- *The identified mitigation, based on the established protocol agreed with by National Parks & Wildlife Service, will avoid adverse effect as it eliminates, during the prescribed period related to the Hen Harrier breeding season, the potential for disturbance operations associated with this project on Hen Harrier within the Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA*

Therefore, the Minister for Agriculture, Food & the Marine has determined, pursuant to Regulation 42(16) of the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) and Regulation 19(5) of the Forestry Regulations 2017 (as amended), based on objective information, that no reasonable scientific doubt remains as to the absence of any adverse effect on the integrity of any European site.'

The FAC considered the contention in the appellant's expansion submission that there was an incorrect screening out of the Lower River Shannon SAC based primarily on the basis that the project area is '*within circa 50 metres of the nearest drain which connects with the SAC*'. The FAC finds that the Appropriate Assessment documentation on file references the existence of the two tributaries of Clydagh [Feale] River which spring to the west of the site and that the closest of these (Lackabane 23) is circa. 250 m from the project area, while the second is circa 400 m from the project area and that both of these streams feed into the Lower River Shannon SAC a further circa 1 km downstream. While the appellant submits that the 'Historic Environment Viewer' shows that drains run within approximately 50 metres of the east of the site the FAC concluded that this in itself does not constitute convincing evidence that the DAFM erred in its screening of the potential effects of the project on the Lower River Shannon SAC having regard to the conclusion reached for the reasons stated which were;

- *Application of the current Annex 1 Habitats Table (18/12/2019), which indicates screen out scenarios in relation to habitats listed as QIs for this European site.*
- *The position of the project area is ca. 1.35 km from the SAC with no hydrological linkage. Thus, no possibility of effects on QIs.*

The FAC noted that the recommended mitigations set out in the AAD are included by condition of the licence granted. Based on the information before it, the FAC finds no reason to conclude that there was any significant or serious error made in complying with the provisions of Article 6(3) of the Habitats Directive, or that the overall conclusion of the AAD was incorrect (other than the temporal period for the Hen Harrier breeding season as discussed above).

The project lands lie within the BREANAGH_010 subbasin (flowing northeast) and the CLYDAGH (FEALE)_010 (flowing northwest). Both Waterbodies have a GOOD status assigned to them in 2013-18 EPA assessment period and neither waterbody is at risk. The FAC notes that the DAFM Appropriate Assessment screening report records that the project area has no direct hydrological connection to a watercourse and that two tributaries of Clydagh [Feale] River spring to west of the site. The closest of these, it states, is the Lackabane 23 which is circa 250 m from the project area, while the second is circa 400 m from the project area. The FAC also notes that in relation to felling and planting operations that condition (a) in the licence requires the licensee to '*ensure that all felling and planting operations are carried out in accordance with Forestry and Water Quality, Forest Biodiversity, Forest Harvesting and the Environment, Forestry*

and Archaeology, Forestry and the Landscape and Forestry and Aerial Fertilisation guidelines and the Code of Best Forest Practice - Ireland and the Irish National Forest Standard published by the Department, except as may otherwise be required in order to comply with the following conditions'. Condition (i), being a recommendation of the IFI, requires harvesting to be done in dry weather only. Having regard to the characteristics of the site, the nature and scale of the proposed development, and subject to adherence to conditions in respect of water protection attaching to the licence, the FAC concludes that the proposed licensed development is not likely to have an adverse impact on water quality.

In its letter expanding on the grounds of appeal in this case, the appellant submits that there was inadequate consideration of the impact of the licenced operations on certain species listed under Annex IVa of the Habitats Directive, which provides for strict protection of those species under Article 12-16. Specifically, it is submitted that consideration of such species is confined to their being qualifying interests for Natura 2000 sites, SACs, and that the protections required under the Directive extend beyond such circumstances. The appellant has not submitted any specific information to indicate that there are any Annex IV species on the project lands or any reasons as to why any Annex IV species would be likely to be adversely affected by the proposed development. Based on the evidence before it, the FAC finds no reason to conclude that there was any significant or serious error made in the making of the decision to grant the licence in respect of this issue.

The FAC considered all of the documentation before it, including written submissions, oral submissions made at the oral hearing, and the consultant ornithologist's report and concluded that a significant error or series of errors had been made in the making of the decision to grant the conditioned licence by reason of applying an incorrect Hen Harrier breeding season (1st April to 15th August, inclusive) to condition h) and j) of the licence. In deciding to vary the decision to grant the licence, the FAC concluded that, while all other conditions should be applied to the licence, conditions h) and j) should be amended as follows:

Amend condition h) by amending reference to the Hen Harrier breeding season (1st April to 15th August, inclusive) to read as "the Hen Harrier breeding season (1st March to 15th August, inclusive), while otherwise retaining the wording of condition h) and that a reason for the inclusion of the condition should be set out in the licence.

Amend condition j) so that, in all cases in mitigation measures as per the AAD, where reference is made to the Hen Harrier breeding season being 1st April to 15th August, inclusive, this shall be amended by reference to the Hen Harrier breeding season being "1st March to 15th August, inclusive"

Yours sincerely,

 Seamus Neely, On Behalf of the Forestry Appeals Committee



Brief for Consultant Ornithologist

Introduction:

The Forestry Appeals Committee (FAC) are currently considering 3rd party appeals against the decision of the Minister for Agriculture, Food and the Marine to grant licences for the carrying out of forestry operations at various locations throughout the country. There are thirteen licences concerned and all of these were granted with conditions attached.

Specifically, the subject appeals are against the decision of the Minister to grant a licence for forestry operations, which include felling, restocking and afforestation, on sites which are in or adjacent to European sites for which the Hen Harrier and/or the Merlin are qualifying interests.

The FAC will convene Oral Hearings on these cases in Portlaoise on Wednesday 17th and Thursday 18th November 2021. The Committee hearing the cases will consist of the Chairperson and three Deputy Chairpersons. In addition, the Committee will be assisted by a Consultant Ornithologist, who will hear the submissions made and participate in the proceedings at the discretion of the Chairperson. The agenda for the Oral Hearings will be limited to hearing submissions (and discussion at the discretion of the Chairperson) in respect of the conditions relating to the protection of the Hen Harrier and/or Merlin.

In advance of the Oral Hearing, the FAC will provide to the Consultant Ornithologist a synopsis of each of the cases to be heard.

Advice sought:

The advice sought from the Consultant Ornithologist relates to specific conditions attached to each of the appealed licences, specifically relating to the protection of the Hen Harrier and/or Merlin. Samples of the conditions concerned are attached below.

Based on the information before the FAC in relation to each appeal (including information submitted at the Oral Hearings), and having regard to the location of the sites concerned and the extent of existing forestry operations in the vicinity of each of the sites, the FAC is seeking expert opinion, including specifically on the following matters:

1. Are the specific conditions attached to each of the licences (including those relating to reforestation) adequate to avoid impact on the Hen Harrier in terms of habitat loss, damage to nest sites or direct mortality, to such an extent as would be likely to prevent the achievement of favourable conservation status of that species? If the conditions are not considered adequate, then how should they be amended to achieve their purpose?
2. Are the specific conditions attached to each of the licences (including those relating to reforestation) adequate to avoid impact on the Merlin in terms of habitat loss, damage to nest sites or direct mortality, to such an extent as would be likely to prevent the achievement of favourable conservation



status of that species. If the conditions are not considered adequate, then how should they be amended to achieve their purpose?

3. Specifically, is there any scientific basis for the temporal and spatial parameters attached to these conditions, and is there any known scientific basis for varying these parameters?

Following the Oral Hearing, the Consultant Ornithologist will submit a written report to the Chairperson containing the advice sought. The report should be submitted as soon as possible, but within the period of 3 weeks following the closing of the Oral Hearing.

Sample Conditions

h) No Felling or other forestry operations associated with this licence shall take place during the period 1st March to 31st August inclusive, within 100 metres of the forest edge, where such forest edge is immediately adjacent to moors, heathland, peat bogs or natural grassland; or within 100 metres of a clearing in the forest of larger than one hectare. Such operations can commence in sections of the project area furthest away from the 100 metre exclusion zone. Such operations can progress towards this exclusion zone but can only enter it during the period 1st September to 29th February inclusive.

Reason: In the interest of protecting the Special Conservation Interest of the Slieve Aughty Mountains SPA as per the Appropriate Assessment determination for GY10-FL0140.

j)The site of this project lies wholly within a Green Area in relating to Hen Harrier, the Special Conservation Interest of the SPA. Therefore, potential disturbance operations associated with this project (see below) can take place during the Hen Harrier breeding season (1st April to 15th August, inclusive). However, if the Department of Agriculture, Food & the Marine (DAFM) is notified by the National Parks & Wildlife Service of a new Hen Harrier nesting site, and if the site of the project lies within or partially within 1.2 km of this location, the DAFM will inform the Applicant of this situation and will amend the terms of the licence, with immediate effect, to exclude potential disturbance operations from taking place during the Hen Harrier breeding season (1st April to 15th August, inclusive). (A potential disturbance operation is a forestry operation associated with a licenced project, which has the potential, through excessive noise, vibration, mechanical movement, artificial lights, etc. to disturb the breeding activity of Hen Harriers. Potential disturbance operations include: timber felling (thinning, clearfell); timber extraction to roadside; timber loading at roadside; aerial fertilisation; mechanical cultivation for both afforestation and reforestation; forest road construction (and associated developments); the driving of fencing posts; and any other operation(s) the Forest Service may deem as potentially creating disturbance.)



Reason: In the interest of protecting the Special Conservation Interest of the Slieve Aughty Mountains SPA as per the Appropriate Assessment determination for GY10-FL0140.
Forestry Appeals Committee
15.10.2021.

Ornithological Opinion on conditions attached to appealed felling licences, specifically relating to the protection of the Hen Harrier and/or Merlin

Report to the Forestry Appeals Committee

Dr Alan Fielding BSc (Hons), MSc, PhD, FHEA, FLS

2nd December 2021

Background and Requests

The FAC sought my opinion on the following three matters:

1. Are the specific conditions attached to each of the licences (including those relating to reforestation) adequate to avoid impact on the Hen Harrier in terms of habitat loss, damage to nest sites or direct mortality, to such an extent as would be likely to prevent the achievement of favourable conservation status of that species? If the conditions are not considered adequate, then how should they be amended to achieve their purpose?
2. Are the specific conditions attached to each of the licences (including those relating to reforestation) adequate to avoid impact on the Merlin in terms of habitat loss, damage to nest sites or direct mortality, to such an extent as would be likely to prevent the achievement of favourable conservation status of that species. If the conditions are not considered adequate, then how should they be amended to achieve their purpose?
3. Specifically, is there any scientific basis for the temporal and spatial parameters attached to these conditions, and is there any known scientific basis for varying these parameters?

My comments should be interpreted as applying specifically to the appeals considered in the meeting on the 17th and 18th November 2021 dealing with case reference numbers: GY10-FL0141, TFL 00426019, TFL 00225618, LS06-FL0053, LS06-FL0054, GY21-FL0039, GY21-FL0038, CK01-FL0063, GY10-FL0140, LK01-FL0207, GY27-FL0050, GY22-FL0008, TFL 00150218.

I recognise that my conclusions may have more general application outside of the above cases. My conclusions were derived whilst paying due regard to the precautionary principle.

Sample Hen Harrier Condition (Green Area)

The site of this project lies wholly within a Green Area in relating to Hen Harrier, the Special Conservation Interest of the SPA. Therefore, potential disturbance operations associated with this project (see below) can take place during the Hen Harrier breeding season (1st April to 15th August, inclusive).

Sample Hen Harrier Condition (Red Area)

The site of this project overlaps with a High Likelihood of Nesting Area relating to Hen Harrier, the Special Conservation Interest of the SPA. Therefore, no potential disturbance operation(s) associated with this project shall take place during the Hen Harrier breeding season (1st April to 15th August, inclusive). To do so will lead to the immediate cancellation of this licence and may represent an offence under the Birds & Habitats Regulations (2011) (S.I.477 / 2011). (A potential disturbance operation is a forestry operation associated with a licensed project, which has the potential, through excessive noise, vibration, mechanical movement, artificial lights, etc. to disturb the breeding activity of Hen Harriers. Potential disturbance operations include: timber felling (thinning, clearfell); timber extraction to roadside; timber loading at roadside; aerial fertilisation; mechanical cultivation for both afforestation and reforestation; forest road construction (and associated developments); the driving of fencing posts; and any other operation(s) the Forest Service may deem as potentially creating disturbance).

Hen Harrier Condition Observations

Assuming there are no restrictions relating to merlin or other qualifying species.

- a. No operations are allowed anywhere within the site during the breeding season if the site is within 1.2 km of a known hen harrier nest site. This condition is effectively a temporal constraint as the restriction, once applied, has no other spatial exemption. **Therefore, the first issue for my opinion relates to the start and end dates of the hen harrier breeding season.**
- b. If the site is not within 1.2 km of a known hen harrier nest site there are no restrictions unless a new hen harrier breeding site is identified before felling begins. If a new site is found condition applies. **Therefore, the second issue for my opinion relates to the adequacy of the High Likelihood of Nesting Areas.**

Sample Merlin Condition

No Felling or other forestry operations associated with this licence shall take place during the period 1st March to 31st August inclusive, within 100 metres of the forest edge, where such forest edge is immediately adjacent to moors, heathland, peat bogs or natural grassland; or within 100 metres of a clearing in the forest of larger than one hectare. Such operations can commence in sections of the project area furthest away from the 100 metre exclusion zone. Such operations can progress towards this exclusion zone but can only enter it during the period 1st September to 29th February inclusive.

Merlin Condition Observations

Assuming there are no restrictions relating to hen harrier or other qualifying species.

- a. There is a spatial constraint, a 100 m exclusion buffer during the breeding season. This exclusion buffer only applies if the felling is adjacent to open areas. Felling and other operations are allowed outside of this buffer at all times. **Therefore, the first issue for my opinion relates to adequacy of a 100 m buffer.**
- b. If the felling is adjacent to open areas, no operations are allowed within 100 m of the forest edge during the breeding season. **Therefore, the second issue for my opinion relates to the start and end dates of the merlin breeding season.**

Conclusions

The evidence that I used to arrive at my responses is detailed in the report.

FAC Question	My response
1. Are the specific conditions attached to each of the licences (including those relating to reforestation) adequate to avoid impact on the Hen Harrier in terms of habitat loss, damage to nest sites or direct mortality, to such an extent as would be likely to prevent the achievement of favourable conservation status of that species? If the conditions are not considered adequate, then how should they be amended to achieve their purpose?	Using the best scientific information available to me, and my interpretations of such information, I am content that the felling and replanting conditions, amended as suggested in my response to question 3, will not have a negative effect on the current conservation status of hen harriers in the SPAs.
2. Are the specific conditions attached to each of the licences (including those relating to reforestation) adequate to avoid impact on the Merlin in terms of habitat loss, damage to nest sites or direct mortality, to such an extent as would be likely to prevent the achievement of favourable conservation status of that species. If the conditions are not considered adequate, then how should they be amended to achieve their purpose?	Using the best scientific information available to me, and my interpretations of such information, I am content that the felling and replanting conditions, as currently specified, will not have negative effects on the current conservation status of merlins in the SPAs.
3. Specifically, is there any scientific basis for the temporal and spatial parameters attached to these conditions, and is there any known scientific basis for varying these parameters?	Yes, there is scientific basis for the temporal and spatial parameters attached to the conditions. But, to remove an element of potential disturbance, I suggest that the temporal restriction for hen harriers is extended to begin on March 1st.

Report Structure

My report focuses on six factors that are either directly, or peripherally relevant, to the appealed felling conditions. The first four factors are directly relevant to the appeals considered in the meeting on the 17th and 18th November 2021 dealing with reference numbers: GY10-FL0141; TFL 00426019; TFL 00225618; LS06-FL0053; LS06-FL0054; GY21-FL0039; GY21-FL0038; CK01-FL0063; GY10-FL0140; LK01-FL0207; GY27-FL0050; GY22-FL0008 and TFL 00150218.

The remaining two factors are less directly relevant to the above appeals but provide additional context for my conclusions with respect to the first four factors. It is important to recognise, at the start, that the ecologies of these species, particularly the hen harrier, are complex and often poorly understood so my conclusions reflect my interpretation and weighting of the evidence and published studies.

1. Timing of operations
2. Distance restrictions
3. Green and Red hen harrier areas
4. Re-forestation
5. Hen harriers and forests
6. Favourable Conservation Status.

1. Timing of Operations

The licence conditions for both species include restrictions covering the breeding seasons. What is the evidence that these periods are adequate and appropriate?

1.1 Hen harrier

If there is historic evidence of adjacent (see Section 3) hen harrier breeding attempts the felling licence conditions prohibit forestry operations between 1st April to 15th August, inclusive.

Table 1 is a summary of the assumed hen harrier breeding season in the United Kingdom (Hardey *et al.*, 2013), as applicable to hen harrier surveys.

Table 1. Summary of hen harrier breeding season in the UK (Hardey *et al.*, 2013).

Breeding activity (No. of days)	Range	Peak Period
Site occupation & display	Late February to late May	Early April to early May
Nest building	April to late May	-
Egg laying (5-12 days)	Mid April to late June	Late April to mid May
Incubation (29-31 days)	Mid April to late July	Late April to mid June
Hatching	Mid May to late July	Late May to mid June
Young in nest (28-39 days)	Mid May to late August	Late May to mid July
Fledging	Mid June to late August	Late June to mid July
Juvenile dispersal	August to September	-

O'Donoghue (2010) presented data on breeding dates for 86 clutches in Ireland. The median laying date was the 5th May with an earliest date of 16th April (Kerry, 2008) and a latest of 10th June (Slieve Aughties, 2008). Fledging occurred from as early as the week of 18th – 24th June, to as late as the week of 6th – 12th August, and peaked during the week of 9th – 15th July. Fledged young remained within 1 km of the nest until 26th August.

The felling licence conditions between 1st April to 15th August fit with the peak period of nest activity but operations in March have the potential to prevent hen harriers from selecting nest sites that could be close to the proposed forest operations. Starting felling operations prior to April 1st could lead to a relatively small change in a nest location but it also has the potential to displace the birds over much greater distances, potentially to a new location outside of the SPA.

Tree planting in Scottish SPAs is rare but I found one recent example (Cambusmore¹) with conditions imposed by SNH (now NatureScot). *“All operations will take place outwith the hen harrier breeding season (March to mid-August inclusive) or within this period only if preoperational hen harrier surveys have been done and concluded there was no breeding”.*

In verbal evidence at the hearing Coillte stated that if NPWS gets information before April 1st about a new nest location, not in an existing red zone, forestry activities will be stopped. There are two points of note about this statement. First, it wasn't clear if this action was codified in the relevant directives. Second, and of more relevance to this section, it is only possible to give notice of a new nest if it was discovered last year or was a new nest in the current year. If it is considered that a new

¹ I need to declare an interest in that I provided some advice and analyses following the death of Paul Haworth who had been providing advice on this scheme.

breeding location can be located before April 1st then clearly the April 1st start date is too late in the breeding season.

The current hen harrier breeding season restriction of April 1st to mid August may not take account of potential disturbance early in the hen harrier breeding season. It is suggested that the current restriction of operations period should be extended from March 1st to August 15th.

1.2 Merlin

The felling licence conditions prohibit forestry operations between 1st March to 31st August inclusive. Table 2 is a summary of the assumed merlin breeding season in the United Kingdom (Hardey *et al.*, 2013). There are few other sources of detailed information and more general descriptions are similar to those in Table 2. Fernández-Bellon *et al.* (2011) studied the diet of the merlin in Ireland during the breeding season using monthly surveys between April and July. Rebecca *et al.* (1992) surveyed for signs of occupation or nesting between March and May in NE Scotland. Finally, Heavisides (1987) noted that British merlin were generally found on their breeding sites from March (initial site occupation) until August.

Table 2. Summary of merlin breeding season in the UK (Hardey *et al.*, 2013).

Breeding Activity	Peak Period	Range
Site occupation		Late February to late April
Courtship display		Late March to late April
Egg laying	Early May to mid-May	Late April to early June
Incubation	Early May to mid-June	Late April to early July
Hatching	Early June to mid-June	Late May to early July
Young in nest	Early June to mid-July	Late May to early August
Fledging		Late June to early August
Juvenile dispersal		Early July to early September

The merlin felling licence conditions, restricting forestry operations between 1st March to 31st August, appear to be robust and no amendment is suggested.

2. Distance Restrictions

Distance restrictions during felling operations are in place to reduce disturbance and apply during the breeding season (Section 1). The most comprehensive review of disturbance distances is that of Ruddock and Whitfield (2007). The Ruddock and Whitfield (2007) review was based on literature reviews and conversations with experts, both national and international. The relevant values for hen harrier and merlin, from Ruddock and Whitfield (2007), are summarised in Table 3. The information, on which these summary statistics are based, is then summarised.

Table 3. An extract from Table 1 in Ruddock and Whitfield 2007. "Summary descriptive statistics on disturbance distances (m) from the expert opinion survey, split according to results on incubating birds and chick-rearing birds. Median values (n opinions in parentheses) and "80%" range values (the range in opinion values after the lower 10% and upper 10% of opinions had been excluded) are shown for AD (= 'alert distance' or 'static' disturbance distance), and FID = ('flight initiation distance' or 'active' disturbance distance)."

	'ALERT DISTANCE'				'FLIGHT INITIATION DISTANCE'			
	INCUBATION		CHICK REARING		INCUBATION		CHICK REARING	
	Median	80%	Median	80%	Median	80%	Median	80%
Hen harrier	310 (24)	<10-750	225 (23)	10-750	30 (27)	<10-500	225 (29)	<10-750
Merlin	225 (22)	<10-500	400 (19)	10-500	30 (30)	<10-300	225 (28)	10-500

2.1 Hen harrier

The following is a summary from Ruddock and Whitfield's (2007) report.

- During wind farm construction, displacement has been suggested to potentially occur up to 500 m around construction sites with some disruption up to 1 km, depending on line of visibility.
- Expert opinion survey's produced a range of values and suggested a maximum buffer of 500 - 750 m.
- The active disturbance distance during the incubation stage was very low, which reflects the tendency for incubating females to flush at close range and reactions at larger distances may be more dependent on the presence of the male.
- Incubating birds may remain on the nest until the last minute even with the mate defending. Remaining on the nest until close range, nevertheless, does not mean that the disturbance source has not been detected.
- Signs of active disturbance were evident at much greater distances during chick-rearing than during incubation (median: 225 m and 30 m respectively).
- Although the expert survey range is compatible with the estimated disturbance displacement suggested during wind farm construction, it is much higher than that seen during wind farm operation (but operating turbines with infrequent maintenance visits is not directly comparable to a single approaching pedestrian or intense activity around construction sites).
- The larger distances of up to 1000 m may indicate acute sensitivity of some pairs as does the opinion of a small minority of survey respondents.

Other observations not in Ruddock and Whitfield (2007).

Caravaggi *et al* (2019) describe the surveying methods used in the Hen Harrier Project (<http://www.henharrierproject.ie/>) "*Where sites were occupied, vantage points were a minimum of 500 m from nests sites* (my emphasis). *Vantage points were identified a-priori based on habitat suitability, topographical constraints and the potential for observers to cause disturbance to breeding birds.*" I presume that they considered 500 m to be a safe distance that would not cause disturbance. Hardey *et al.*, (2013) , in their guide for raptor surveys in Scotland state that disturbance is minimised if nesting areas are viewed from distances of 500 - 700 m and that special care should be taken to minimise disturbance to hen harriers while they are laying, as nests containing one or two eggs may be deserted.

Tree planting in Scottish SPAs is rare but one recent example (Cambusmore) has conditions imposed by SNH. "*All operations will take place outwith the hen harrier breeding season (March to mid-August inclusive) or within this period only if preoperational hen harrier surveys have been done and concluded there was no breeding. No operations associated with this consent will occur within 750m of an active nest. In addition prior to winter operations surveys will be undertaken for roosting hen harriers and any roost identified will be buffered as per best practice.*" The buffering relates to protecting roost sites from any planting rather than disturbance.

The Scottish Forestry Commission (now Forest, Lands and Estates) defined the nesting season as April to August during which time the safe working distances were 500 – 1,000 m. There is an additional comment about the need to avoid winter roosts which is missing from the felling conditions under consideration here. Hardey *et al.*, (2013) also make a comment about winter roosts. Although most roosts seem to be in lowland marshes or mosses, some females will roost individually on old nests in breeding areas between August and October or February to April.

The felling licence distance constraint for hen harriers is implicit in the definition of red areas (Section 3). Historic nest sites are buffered to 1,200 m. Therefore the maximum distance from a nest to the edge of a planned forestry operation, before the licence condition became applicable, would be 600 m. Six hundred meters is within the normal range of suggested safe working distances and there is no need to change this. This conclusion is based on the assumption that the definition of red areas is robust (Section 3).

2.2 Merlin

Lusby *et al* (2015) stated that "*Merlin do not use young forests (<10 years) for nesting. Forests from 11 years to those older than 50 years were used for nesting, with most pairs nesting in forests between 31 and 40 years, which is within the age range for felling or thinning operations in commercial forests. This, coupled with the fact that Merlin naturally occurs at low population densities, highlights the importance of ensuring that forest management operations do not negatively impact their breeding performance.*"

The survey techniques advice for surveying merlin in Scotland (Hardey *et al.*, 2013) states that "*Care should be taken during visits in late March and April to avoid disturbance of merlins at occupied nesting ranges, as this may cause the birds to move. To minimise the risk of disturbance it is recommended that nesting areas are viewed from distances of 300–500 m*".

The following is a summary from Ruddock and Whitfield's (2007) report.

- Little has been published on the effects of human disturbance on merlin.
- In pairs routinely exposed to predictable disturbance, tolerance and habituation is likely because urban nesting is recorded regularly in the US & Canada and reproductive output has been recorded as higher than rural populations.
- Flushing distances of wintering birds ranged from 17 – 180 m for pedestrian disturbance and from 44 – 85 m in response to vehicles.
- > 90% of birds flushed to pedestrians whilst only 38% flushed to vehicles.
- Tree nesting birds are likely to detect disturbance at greater distances than ground nesting pairs. Despite this, tree-nesting birds may respond at shorter distances as some studies have shown birds at a higher elevation appear to have a shorter response threshold.
- Merlin are particularly prone to desertion just prior to egg laying and the risk declines thereafter, although individuals were occasionally found breeding at a different site if disturbance occurred prior to or at the laying of the first egg.
- US forestry guidelines maintain a minimum 91 m no-cut buffer around known merlin nest sites when they are discovered. However, tree-nesting merlin use the old abandoned nests of other species which will have limited survivorship particularly if large merlin broods are reared, so that individual nests are unlikely to be used for more than a few seasons.
- A preliminary 200 – 400 m protective buffer around nest sites for forestry workers was proposed in the UK in 1997 with no apparent empirical support.
- Expert survey revealed a very wide range of opinions on the typical distance at which nesting merlin may be disturbed by an approaching human.
- Static disturbance during incubation ranged from <10 m to 300 – 500 m. This wide range may represent differences in experiences with ground- and tree-nesting birds.
- Empirical records of disturbance distances were few in the literature and confined to observations of non-breeding birds which flushed at up to 125 m distance from an approaching human.

The 100 m threshold for merlin appears appropriate, particularly given the practical difficulties with its implementation with respect to forest operations. Changing the distance has little empirical supporting evidence and any increase would be unlikely to introduce any material changes to forestry operations.

3. Green and Red Hen Harrier Areas

Red and green areas are designed to identify areas likely to be used for nesting. They are defined in Appendix 21 of the Department of Agriculture, Food and the Marine's Forestry Standards Manual (2015).

"Red areas are 1.2 km radius areas centred on known Hen Harrier nesting areas. The 1.2 km radius is based on half the maximum separation distance of annual nest locations within territories observed in the Slieve Aughty Mountains within the 2005-2010 period, plus an additional 500 metre buffer. Depending on the location of their centre point, Red Areas may encapsulate land outside the boundary of the SPA. The remainder of the SPA is referred to as 'Green Areas'. New Red Areas may be generated from time-to-time, as new Hen Harrier nesting sites are identified, either individually or as a result of a regional or national survey."

It is known that hen harriers can breed in close proximity to each other (e.g. Watson, 1977; Balfour & Cadbury, 1975; Simmons, 2000 and O'Donoghue, 2010) and often they have overlapping foraging ranges (e.g. Arroyo *et al.*, 2008). This close proximity can result in the formation of loose 'colonies'. Caravaggi *et al* (2019b) found that the 2010 hen harrier territories were located at least 141 m from the nearest territory in 2015 but with a mean separation of 3.8 km. Irwin *et al* (2012) suggest, using evidence from a *pers. comm.*, that pairs were capable of moving several kilometres between and even within seasons.

Given the loose colonial nature of many hen harrier nesting attempts, combined with a tendency to nest in the same general areas between years but not the same exact location, my assumption was that this would result in overlapping buffers rather than isolated 1.2 km circular buffers. This was confirmed in a verbal response by DAFM. Consequently, it seems reasonable to assume that likely nesting locations are included within the red zones (High Likelihood Nesting Area).

The main concern therefore relates to the historic nature of the data used to create the red zones, it will always be at least one year earlier. DAFM confirmed, verbally, that there is a rapid updating process when new nest sites are located.

How likely is it that a new nest site will be outside of a current red zone? A circle with a radius of 1.2 km has an area of ~4.5 km² so the area occupied by a series of overlapping buffers will be quite large. It would be interesting to know how red zones have changed over the period they have been operational. Have they increased in area, moved or shrunk?

It was suggested that hen harriers in Ireland may have much larger foraging areas than other populations. Caravaggi *et al.*, 2019b comment that *"Poor foraging opportunities in the surrounding landscape may be placing a larger provisioning burden on both parents who consequently must travel greater distances to find food"*. This assumption is based on a single satellite tracked flight and Irwin *et al* (2012) suggested that these were *"larger than usual as the 2010 and 2011 breeding seasons both followed unusually severe winters during which many of the resident upland passerines, an important prey item, was high"*. Other comments about the same tracked birds is also relevant *"..... the three birds showed preferences for second rotation pre-thicket forest, particularly those between 3 and 9 years of age, and for grasslands managed at low intensity"*. (See Section 4).

Breeding dispersal appears to be generally small and this is consistent across studies. In Wales, Whitfield and Fielding (2009) recorded a median breeding dispersal distance of 0.7 km. In Scotland, they usually nest in the same area in successive years, with the median distance moved between

sites from year to year being 0.71 km (Etheridge *et al.*, 1997). Picozzi (1984) found that, in Orkney, known females which had nested one year did so the next year within an average of 1.03 km (n = 163) of the previous year's nest. Etheridge *et al.* (1997) also found a small, but non-significant, difference in distance moved in successive years between successful female breeders (0.63 km) and unsuccessful females (0.81 km). **Breeding dispersal distances on this magnitude, if applied, in Ireland support the 1.2 km radius used for the Red zones particularly given the year on year accumulation of nest sites within a Red zone.**

Given that SPA populations of hen harriers are not large, new nest locations outside of the Red zones are unlikely and, in order to invoke a licence condition, it would have to be within 600 m of the proposed felling. While not impossible, this seems an unlikely scenario. **Therefore, the use of hen harrier red zones is suitably robust.**

4. Re-forestation

Re-forestation does not produce an identical tree cover to that felled because of new open areas and water course set-back distances. One consequence is that potentially new and important foraging strips may be created, particularly around water courses. If the water course runs through the felled block a new open strip up to 40 m wide could be created, which would have the potential to provide habitat supporting hen harrier and merlin prey. Based on considerable evidence from the Isle of Mull (Paul Haworth, *pers comm*) such open spaces can be well used by foraging hen harriers. Indeed, the 2015 national survey (Ruddock *et al.*, 2016) recognised the potential for such habitat use by adding 'Linear features' as a new foraging habitat category (drainage channels, hedgerows, forest rides and open habitat corridors containing power-lines).

Mull has very few merlin so there is no direct evidence that they would benefit in the same way. However, it is difficult to imagine a scenario in which there would be a negative impact from the re-forestation. A shortage of crow nests in remaining mature trees seems unlikely.

The largest concern about re-forestation, excluding the continuing loss of previously open habitat, appears to relate to effects of second rotation pre-thicket forest on hen harrier productivity and survival. The evidence is inconclusive with respect to it having a positive or negative impact.

It has been argued that the creation of significant areas of second rotation pre-thicket forest can become an ecological trap for hen harriers as they apparently suffer poor reproductive success despite a marked selection for this habitat. It has also been suggested that their breeding success can decrease noticeably when the percentage of second rotation pre-thicket forest in the surrounding landscape is greater than 10% (Wilson *et al.*, 2009). It is, therefore, worth examining this suggestion in detail, beginning with the observation that the negative relationship between second rotation pre-thicket forests and hen harrier breeding success appears to be significant only in the Slieve Aughty Mountains.

Irwin *et al* (2020) suggest that, in a forested landscape with a well-balanced age structure, approximately 25% of the forest will be in pre-thicket stage at any one time. This means that as long as there is less than 40% for total forest cover in the landscape the percentage of pre-thicket forest should not be >10%. Therefore, problems, if they are real, should not become apparent until >40% of the landscape is forested.

Irwin *et al* (2012) investigated the ecology of the hen harrier in Ireland between 2000 and 2005. As in other studies the main nesting habitats were pre-thicket stage forests, particularly second rotation plantations. They found no evidence that the area of post-closure plantations impacted negatively on hen harrier nest distribution but there was a positive association between changes in numbers of nests between 2000 and 2005 and changes in the area of pre-thicket second rotation plantations suggesting that the overall effect of plantation forests on breeding hen harriers in Ireland was positive. The same study used satellite tracking data from three breeding adults, tracked for four days, in the Ballyhouras. One surprising result was the maximum distances from the nest: a female was 7.5 km and a male was 11.4 km. However, it is possible that these are larger than usual as the 2010 and 2011 breeding seasons both followed unusually severe winters during which many mortality in the resident upland passerines, an important prey item, was high. Both forest and non-forest habitats were used in proportion to their availability but the three birds showed preferences for second rotation pre-thicket forest, particularly those between 3 and 9 years of age, and for grasslands managed at low intensity. It is difficult to understand why foraging hen harriers would preferentially forage in second rotation pre-thicket forest unless prey was more available (note that prey abundance and availability or not the same although there should be some linkage).

Given that much has been made of the 11km foraging distance it is worth noting that Irwin *et al* (2012) found that over 50% of all GPS records, consistent with hunting behaviour, were <2 km from the nest. Indeed, the concentration of hunting behaviour was more than 10 times higher within 1 km of the nest than it was between 2 - 5 km.

The effect of second rotation pre-thicket forest on hen harriers in Ireland is far from certain and it cannot be assumed to have a negative impact on hen harrier productivity. Wilson *et al* (2012) is a detailed analysis of productivity and habitat and it is worth including some quotes from this work. *"...the lower breeding success experienced by Hen Harriers breeding in landscapes with high levels of second-rotation pre-thicket described here are counter-intuitive – one might expect that Hen Harriers breeding in such landscapes would be more successful than in other habitats. It should be emphasized that these relationships were not consistent across all study areas and that, over the whole dataset, the model including both second rotation pre-thicket and study area explained just 9% more variation than the model with study area alone. **Moreover, we cannot be certain that these relationships were causal, but even if they were, it is likely that second-rotation forests are often valuable for Hen Harriers in Ireland, enabling them to breed in areas where they would otherwise be scarcer or absent"**. [my emphasis].*

In a later study, pre-thicket forests were not observed to have an effect on breeding success (Caravaggi *et al.*, 2019b) and SPAs were observed to have a moderate positive effect on breeding success. However, they considered that the success of SPAs in facilitating breeding success may be skewed by increased success in locations where heather and moorland nesting and foraging habitats were of higher quality.

The evidence for a definitive and causal relationship between the extent of second rotation pre-thicket forest and reduced hen harrier breeding success is weak and generally any interpretations of a mechanism involve many plausible assumptions, typically about increased nest predation [Section 5.2].

5. Hen Harriers and Forests

5.1 Habitat choice

Habitat is the aggregation of physical and biotic factors which make up the sort of place an organism lives. The quality of these factors, especially resource availability and predator exposure, affect an animal's survival and reproductive success. Selection should favour an active choice of areas that enhance reproductive success and survival. In hen harriers, reproductive success has been the focus of many studies, but the habitat factors that correlate with success are difficult to pinpoint. Breeding site choice is the most obvious candidate that can be specifically linked to offspring production and this has been the subject of a number of studies including many in Ireland.

Nesting habitat choices are more adaptable than was previously thought, especially with respect to woodland; this has been noted in Ireland, France and the west of Scotland. Availability of extensive areas of open habitat had always been thought of as vital for successful breeding and hunting by hen harriers; a particular problem when large areas of potential habitat are replaced with conifer plantations. It is important to note that forests planted as an agricultural resource differ greatly from natural woodlands, largely as a consequence of the limited age structure and an even high density of trees. After planting the pre-thicket areas can be attractive to hen harriers but become unsuitable after approximately 12 years.

Although large tracts of continuous forest are unsuitable for hen harriers, patchy woodland with relatively clear areas within hunting distance is not. New afforestation usually creates opportunities for hen harriers with the potential to create local high densities of breeding pairs. At its simplest, establishment of woodland initially provides tall vegetation for nest concealment. Additionally these areas are largely free from the risk of trampling by large herbivores. Finally, burning of adjacent land tends to be restricted allowing taller vegetation to develop around the new planting and reduced grazing can increase preferred prey both within and adjacent to woodland areas. However, as the planted open areas close up there will be an inevitable decline in the local population unless new areas are planted. Blake (1976) considered that new forest plantations were one of the main reasons for the re-colonisation of mainland Scotland by hen harriers. Studies in Ireland indicate that more nests are found in pre-thicket second rotation plantations than in any other habitat, even though that habitat represented < 5% of the study areas (Wilson *et al.*, 2009). This is good, if circumstantial, evidence that active choice for young or low level plantations was taking place.

It is important to place some of the major hen harrier studies, particularly in the UK, into a historical context with respect to large scale changes in forest planting. There were two peaks of planting; the first (1970s) was a combination of Forestry Commission and private schemes. The second, (late 1980s) coincided with the wing tagging study (1990-1995) reported by Etheridge and Summers (2006). Inevitably much of this young plantation habitat was lost as trees matured and, as in Ireland's SPAs, the young forest resource will never be the same again unless new open spaces are planted. Given the plantation ages, the forest estate across much of Scotland and the Irish SPAs is now in a phase of comprehensive restructuring which may involve changes to the trees planted, their density and the configuration of open space. Re-afforestation is not the same as afforestation and it has the potential to create more hen harrier habitat which may give rise to additional nesting opportunities. The progressive implementation of re-afforestation best practice could create more open areas, more broadleaf species and conifer-free riparian zones which have the capacity to

provide an enhanced prey base and nesting opportunities for harriers that could experience less disturbance.

There is some evidence that hen harriers can adapt to new habitats. For example, although approximately 15% of one of France's most important hen harrier populations nest in natural or semi-natural habitats (young plantations, fallow land and marshes) the majority nest in wheat or barley fields (Millon *et al.*, 2002). This preference for crops over natural habitats seems to be relatively recent and applies equally to Montagu's Harriers. There is little evidence of a similar movement in the UK or Ireland, although a relatively recent record of a successful nest in southern England hints that it is possible in the future.

Irish national surveys have demonstrated the importance of forests to a large segment of the breeding hen harrier population (Barton *et al.*, 2006, Ruddock *et al.*, 2012, 2105, Wilson *et al.*, 2009). Ruddock *et al.* (2016) reported that pre-thicket new and second rotation forestry made up 61.5% of all known nesting habitats in 2005 and 64.7% in 1998-2000. Petty and Anderson (1986) recognised the importance of landscape configuration if hen harriers were to breed in restocked conifer forest "*Access to suitable large areas of open ground could be critical for Hen Harriers, and this is seldom available in restocked forest, except at higher elevations where some adjacent moorland may remain unplanted*". Since it is known that hen harriers have nested in forest rides in closed canopy woodland in Argyll (Redpath *et al.*, 1998) suitable forest restructuring may increase such opportunities.

Significantly, habitat configuration appears to become more important as the total amount of open habitat is reduced (Flather and Bevers, 2002). It is, therefore, unsurprising that in much of Ireland, restocked or partially failed forest is used more than elsewhere. A recent analysis of landscape characteristics in Ireland, in relation to hen harrier breeding success, indicated that, at local scales, total forest cover and percentage cover of closed-canopy forest was associated with reductions in hen harrier productivity (Wilson *et al.*, 2012). In some local areas high cover of second rotation pre-thicket reduced nest success and fledged brood size. Therefore, although hen harriers are choosing second rotation pre-thicket as a nesting habitat in much of Ireland, it may be a sub-optimal choice related to the landscape surrounding re-stocked forests. Re-stocked forest appears to be used less in Scotland because sufficient habitat remains outwith the forests, particularly as sheep grazing continues to decline and hen harrier populations in some non-forested regions are small because of other constraints such as persecution.

5.2 Predation on Hen Harriers

One of the main negative impacts of nesting in forests is ***an assumed*** increase in nest predation because of the extra cover provided to the predators (e.g. Avery and Leslie, 1990). Despite this, Etheridge *et al.* (1997) found that, for hen harriers, there were fewer losses due to predation close to forests than to nests in unmanaged moorland.

Eggs and young chicks are particularly vulnerable to predation when parents are absent, which is more likely when prey is in short supply or adults have been disturbed. Like most other places where hen harriers are studied, **data on the abundance and activity of upland predators in Ireland are scarce** and assessments of the level of impact are largely based on assumptions with a list of potential predators that includes foxes, pine marten, American mink, stoat, raven and hooded crow.

Hen harriers are very variable in their nest defence, showing both individual variability and temporal changes. It is assumed that nest defence has an important role in deterring ground predators, (Simmons *et al.*, 1986) though there are few direct examples. Unfortunately many examples of ground predators such as the red fox *Vulpes vulpes* and hooded crow, *Corvus corone cornix*, are anecdotal and quantitative information on population effects is scant.

O'Donoghue (2010) attributed 55% of all nest failures in south and west Ireland in 2007 and 2008 to predation events but it is unclear what a 'natural' predation failure rate should be. Is 55% high, normal or low compared to a theoretical population in an environment not altered by humans? Predation is part of the natural process of hen harrier population regulation. It becomes a problem only when anthropogenic activities lead to much more predation than would be expected in a natural landscape, leading to reduced survival or, more likely, reduced productivity. Conversely, anthropogenic activities can reduce natural levels of predation, for example, when ground and avian predators are controlled. However, it is clear from the current and recent hen harrier distribution in the United Kingdom that the comprehensive control of ground predators on grouse moors does not result in healthy hen harrier populations. When studies have been undertaken (e.g. Amar and Redpath, 2002 and Baines and Richardson, 2013) the conclusions are not robust enough to identify consistent and significant impacts on the conservation status of the hen harrier.

Adults, rather than young in the nest, are probably at greatest risk when there are large apex predators such as golden and white-tailed eagle. The white-tailed eagle may become an important predator of hen harriers as the Irish population increases. For example, Sansom *et al* (2016), in a review of the future for Scotland's white-tailed eagles noted that "*It would be interesting to study how the expanding population of white-tailed eagles affect other raptor species of conservation concern. In particular, the hen harrier (Circus cyaneus) breeds in high densities on some Scottish islands and it is possible that increased abundance of white-tailed eagles might have negative impact on hen harriers on these islands. In an international perspective, it is very rare that the geographical breeding range of hen harriers and white-tailed eagles overlap...*". Ireland, like the Scottish Western Isles will be another example where the geographical breeding range of hen harriers and white-tailed eagles overlap.

6. Favourable Conservation Status (FCS)

There are generic FCS rules for Ireland's hen harriers and merlins in NPWS SPA documents. The absence of specific targets is regrettable but it is possible to infer if actions are likely to be positive, neutral or negative with respect to FCS.

The favourable conservation status of a species is achieved when:

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

Assessing the conservation status of a species inevitably involves comparing the current situation against targets such as a target population size which is a product of density and habitat extent. But, how large should target populations be? This is not a simple question to answer since it involves making value judgements about the relative merits of different species, habitats and time scales. This was expressed quite trenchantly by Monbiot (2013) as *"... A tendency I've noticed among some groups is to try to make all their target species common, even if they were naturally rare. Perhaps some species ought to be rare. Those which lived in open habitats – which would have been small and occasional before people started cutting and burning the forests – are likely to have been rarest of all."* In the case of an open ground predator, such as the hen harrier, this means that judgements have to be made about the desired extent and quality of open ground, both of which are influenced by factors other than their conservation status. If density is held constant but the extent or quality of habitat decreases so will the hen harrier population size.

In addition, a judgement is needed on the desired density of breeding attempts. In the case of hen harrier density there is additional complexity arising from its apparent loose coloniality which means that it cannot be assumed that breeding attempts are spaced evenly across suitable breeding habitat or are constant year on year.

Habitat constraints reduce the extent and quality of nesting and foraging habitat. Additionally, there may be landscape level effects that alter the spatial relationship between nesting and foraging habitat, for example by retaining good nesting habitat but reducing the extent and quality of foraging habitat close to nest sites and *vice versa*. The principal constraints on habitat are those which alter vegetation height and structure. Changes to the height and structure of vegetation can have direct and indirect effects on nesting habitat and on prey distribution, abundance and availability. Processes which may alter the extent and quality of habitat include grazing (and burning); forestry operations, weather and wind farm construction.

There is little information on merlins in Ireland so the majority of the subsequent text relates to hen harriers.

6.1 Dispersion and Site Fidelity

Dispersal and site fidelity are related to both the species range and its population dynamics. There are two categories of dispersal: dispersive and philopatric. Differences between them have important consequences for understanding hen harrier population biology.

Dispersive dispersal implies extensive natal (from the nest) and breeding dispersal. In this mode young birds do not come back to breed in their natal site and breeding birds do not return to the same site next year. This is important in the context of understanding the ecology of hen harriers in Ireland's SPA.

The alternative philopatric dispersal type has three modes:

- marked breeding site fidelity of adults, particularly males;
- faithfulness to the site and sub-group of adults within a colony (particularly males) with marked inter-colony movements of young birds particularly females or
- marked philopatry by adults and young males (return to breed close to where they fledged) but with some natal dispersal between sites by young females.

Categorisation of hen harrier dispersal is significant for understanding and modelling local and national hen harrier populations and understanding if the species has a FCS. New *et al.* (2011), describing their population model of a Scottish hen harrier population, stated "*We do not account for fecundity as it does not affect harrier density in an area. This results from high rates of juvenile dispersal, with almost no natal site fidelity. However, after dispersal, harriers are site faithful*". This assumption means that the fate of a population would be dependent entirely on recruitment which will not, apparently, contain a significant proportion of local birds. In the context of Ireland's SPAs this could mean that the number of hen harriers pairs is dependent on what is happening outside of SPAs. This assumption appears to rest on ringing and wing tagging studies in Scotland that may have been confounded by the state of the forest estate at the times of the study.

The New *et al.* (2011) population model attempted to explain changes in the number of breeding females in the Scottish Langholm population and this population was also modelled by Baines and Richardson (2013) but they had different assumptions and arrived at a completely different explanation. The New *et al.* (2011) model was based on two important dispersal assumptions that are relevant to understanding the conservation of hen harriers in Ireland's SPAs.

1. Little natal site fidelity implies that **immigration, rather than productivity, determines the population growth rate**. They estimated that an increase of 100 Meadow Pipits per km² would raise recruitment, i.e. immigration, by 9% whilst the same vole increase would raise recruitment by 14%.
2. The **probability of settlement was related to the abundance of prey**. Predictions from their model were a good approximation to reality, which was a large increase between 1995 and 1997 followed by two years of decline.

Implications from the New *et al.* (2011) model are that quite large increases in the number of breeding attempts could occur in a particularly good prey year but this might be followed by a slow decline if there was no further recruitment but pairs remained faithful to their breeding sites. This type of dynamics has been observed in some of the Scottish SPA populations.

It is clear from population models that, as productivity increases adult survivorship becomes relatively less important but always remains the most important factor. Adult survivorship is influenced by a range of factors including predation, weather and prey availability.

The overall conclusion from this type of analysis is that accurate and robust estimates of annual survival rates must take account of both mortality and dispersal. It is very difficult to fully understand the dynamics of any hen harrier populations in the absence of this information. This

creates a problem for understanding how Ireland's SPA populations should be managed. For example, the New *et al.* (2011) and Baines and Richardson (2013) models make similar predictions for the same population despite making very different assumptions about population dynamics. Both cannot be correct. Nonetheless, their similar predictions reinforce the importance of robust knowledge about hen harrier dispersal and philopatry if appropriate management techniques and threat reductions are to be developed. **In the context of Ireland's SPAs it is essential to understand the balance between natal philopatry and immigration.**

Whitfield and Fielding (2008, 2009), in their study of the Welsh population, had a median natal dispersal distance of recovered hen harriers of 18.4 km (females) and 12.1 km (males). In Scotland, the median natal dispersal distance in female hen harriers was 10 km and 51 km for birds hatched on moorland and conifer forest respectively (Etheridge *et al.*, 1997). Whitfield and Fielding (2009) concluded that the Welsh population probably has low linkage with other breeding areas in the British Isles and that, at least currently and for females, is more-or-less 'closed'. It is reasonable to assume a similar logic applies in Ireland (including Northern Ireland).

Breeding dispersal appears to be generally small and this is consistent across studies. In Wales, Whitfield and Fielding (2009) recorded a median breeding dispersal distance of 0.7 km. In Scotland, they usually nest in the same area in successive years, with the median distance moved between sites from year to year being 0.71 km (Etheridge *et al.*, 1997). Picozzi (1984) found that, in Orkney, known females which had nested one year did so the next year within an average of 1.03 km of the previous year's nest and that female harriers that moved into a new territory moved further following breeding failure than after successful breeding. Etheridge *et al.* (1997) also found a small, but non-significant, difference in distance moved in successive years between successful female breeders (0.63 km) and unsuccessful females (0.81 km). **Breeding dispersal distances on this magnitude, if applied, in Ireland support the 1.2 km radius used for the red zones particularly given their five year roll over.**

6.2 Population trends

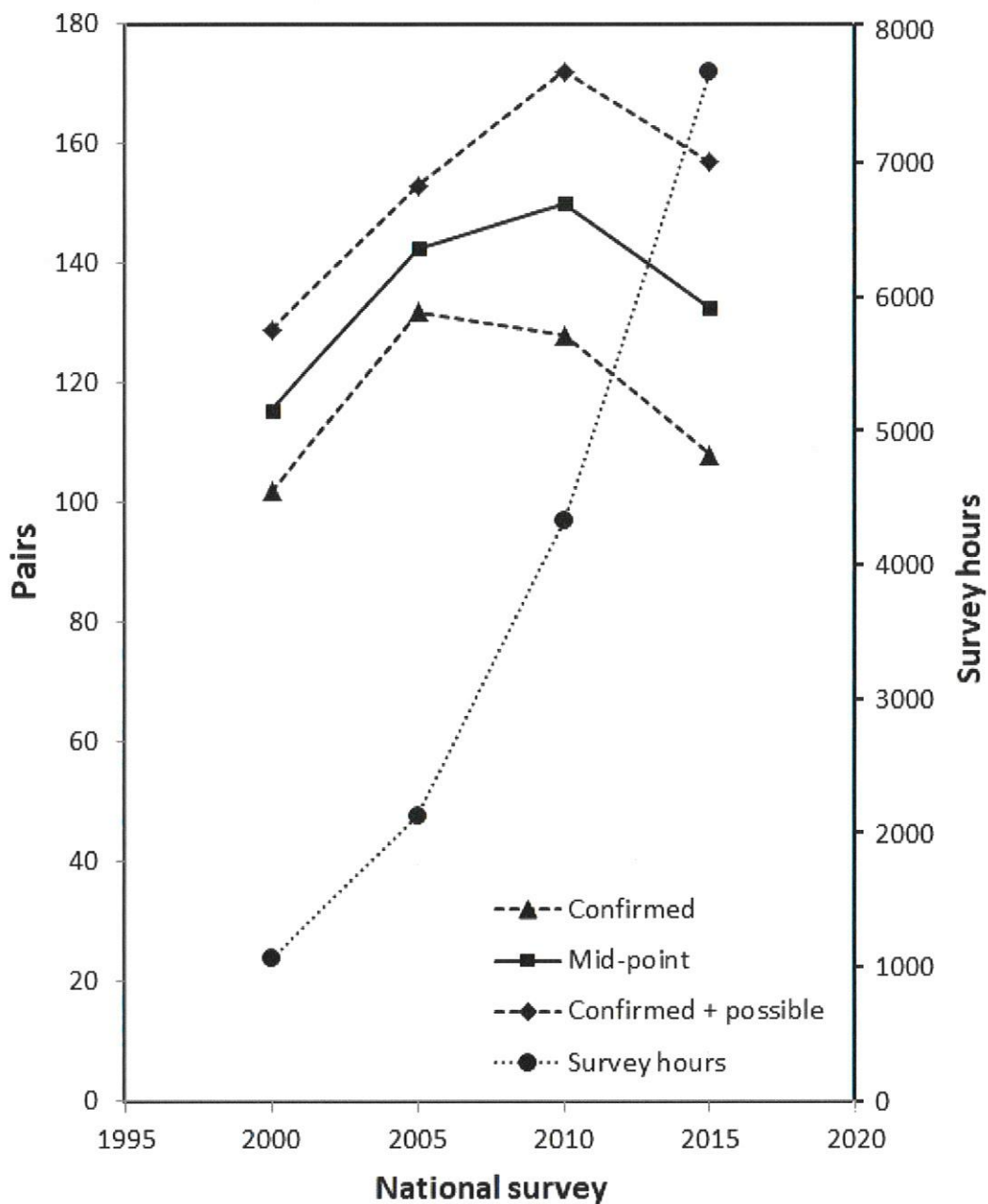
Figure 3 in Ruddock *et al.* (2016) appears to show a dramatic decline in hen harriers in the 2015 national hen harrier survey despite vastly increased survey effort. However, the axes and fitted curves are potentially misleading, at least without a detailed consideration of the data. Fig.1 is redrawn from Figure 3 in Ruddock *et al.* (2016) but with both axes starting at 0. Note that the survey hours in 1998-2000 survey are a hindcast and should be treated with considerable caution. The mid-point is halfway between the number of proven breeding pairs and the number of proven breeding pairs plus the number of proven plus probable breeding pairs. The interval between these two is the number of probable breeding pairs (this number includes pairs where the presence of a pair was not established with strong evidence). The use of the mid-point is an understandable but rather arbitrary value.

Fitting a linear trend to the number of proven pairs suggests no significant change, whilst the linear trends for the number of confirmed and possible pairs or the mid-point, are both significantly positive despite the 2015 decline.

The increase in survey effort is a problem for any interpretation of population trends but, in general, it should be interpreted that precision increases as the survey effort increases. While that might give weight to the suggestion of a decline, the increasing uncertainty or error associated with earlier

surveys means that the number of pairs should be considered to be increasingly imprecise in the earlier surveys. However, if it is assumed that confirmed pairs were correctly identified the uncertainty must rest in unrecorded and possible pairs. It is noticeable that increased survey effort is associated with an increase in the number of possible pairs which creates a wider gap between the number of confirmed pairs and the number of confirmed plus possible pairs. Therefore, despite the increased survey effort, the consequence is an increased uncertainty about the value of the mid-point. So, although increasing survey effort might be expected to increase precision it appears to have decreased it, at least for the mid-point metric is to be one of the most often cited trend measures.

Figure 1. Trends in hen harrier pairs across four national surveys (redrawn from Figure 3 in Ruddock et al (2016)).



Ruddock *et al* (2016) attempted to deal with the uncertainty created by changes in survey effort by restricting comparisons to only the 10 km squares surveyed in all four national surveys. “*Within these 78 squares in 1998 – 2000, there were 110 – 155 pairs which declined in 2005 to 110 – 127 pairs (-18.1%) with a small increase recorded in 2010 to 100 – 132 pairs (+3.9%) and finally a decline in 2015 to 78 – 103 pairs (-21.9%). Overall from 1998 – 2000 there has been a decrease by approximately one third (-33.5%) in these squares which have received coverage across all surveys.*” Note that the percentage declines refer to confirmed + possible pairs and not confirmed pairs. If confirmed pairs is used the small increase in 2010 is actually a -14.8% decline. It is reasonable to conclude that the number of pairs has declined in those 78 squares

However, a decline in those 78 squares masks complex changes, including increases and losses, across surveys and regions (Table 13 in Ruddock *et al* (2016)) which suggests some mobility in the breeding Irish hen harrier population, particularly given the spatial and temporal dynamic nature of first and second rotation pre-thicket woodland.

The Hen Harrier Project (<http://www.henharrierproject.ie/resources.html#>) reported that, in 2021, there were 62 confirmed breeding pairs and seven possible breeding pairs of Hen Harriers within the SPA network (a population range of 62 - 69 territorial pairs). **This is similar to the total numbers of territorial pairs recorded within the SPAs since their annual monitoring began in 2017 (58 -70 pairs); 2018 (53 - 68 pairs); 2019 (56 - 63 pairs); and, 2020 (58 - 62 pairs). It is possible that previous population fluctuations in the SPA populations have stabilised.**

Caravaggi *et al* (2019a) have considered how multiple factors need to be considered when attempting to understand the Irish hen harrier population. They suggest that the narrow focus of previous research means that there is little information about the broader range of anthropogenic pressures that might impact breeding their foraging and breeding habitat.

Pressures on Ireland’s hen harrier, and by extension the merlin, are not homogenous in severity or extent. The three most probable candidates for causing reduced productivity in Ireland are, in no particular order, insufficient available prey, poor breeding season weather and nest predation. It is unlikely that these three constraints are independent or constant across the hen harrier’s range, as illustrated by the considerable year on year variability in productivity recorded by the Hen Harrier Project. For example, as a direct consequence of wet and cold weather, poor breeding season weather may lead to reduced prey populations and poor nest survival. Poor weather can reduce foraging time and increase the risk of nest failure and while reduced prey may be associated with an increased risk of nest predation as other prey become scarce and parents forage for longer.

Caravaggi *et al* (2019b) showed that breeding success was negatively influenced by rainfall early in the breeding season and impending climatic instability could create greater year on year variation. Caravaggi *et al* (2019b) thought that chicks were most vulnerable to changes in minimum temperature, possibly exacerbated by rainfall, during the early stages of the breeding season.

In summary, attempting to understand the Irish hen harrier population in terms of only the extent and location of first and second rotation pre-thicket forestry in SPAs will never be successful.

REFERENCES

- Amar, A. and Redpath, S. M. 2002. Determining the cause of the Hen Harrier decline on the Orkney Islands: an experimental test of two hypotheses. *Animal Conservation*, **5**, 21–28.
- Arroyo, B., Amar, A., Leckie, F., Buchanan, G. M., Wilson, J. D. & Redpath, S. 2008. Hunting habitat selection by Hen Harriers on moorland: implications for conservation management. *Biological Conservation*, **142**, 586-596.
- Avery, M. and Leslie, R. 1990. *Birds and Forestry*. T & A. D. Poyser, London.
- Baines, D. and Richardson, M. 2013. Hen Harriers on a Scottish grouse moor: multiple factors predict breeding density and productivity. *Journal of Applied Ecology*. **50**, 1397–1405.
- Balfour, E. and Cadbury, C. J. 1975. A population study of Hen Harrier (*Circus cyaneus*) in Orkney. In Goodier, R. (ed) *The Natural Environment of Orkney*. Nature Conservation Council, Edinburgh. 122-128.
- Barton, C., Pollock, C., Norris, D. W., Nagle, T., Oliver, G. A. & Newton, S. 2006. The second national survey of breeding Hen Harriers in Ireland. *Irish Birds*, **8**, 1-20.
- Blake, E. A. 1976. The return of the Hen Harrier. *Forth Naturalist and Historian*, **1**, 21-38.
- Caravaggi, A., Irwin, S., Lusby, J., Ruddock, M., Mee, A., Nagle, T., O'Toole, L., O'Neill, S. and O'Halloran, J., 2019a. Anthropogenic pressures within the breeding range of the Hen Harrier *Circus cyaneus* in Ireland. *Bird Study*, **66**(4), pp.461-470.
- Caravaggi, A., Irwin, S., Lusby, J., Ruddock, M., O'Toole, L., Mee, A., Nagle, T., O'Neill, S., Tierney, D., McCarthy, A. and O'Halloran, J., 2019b. Factors influencing Hen Harrier *Circus cyaneus* territory site selection and breeding success. *Bird Study*, **66**(3), pp.366-377.
- Cormier, J. P., Fustec, J., Pithon, J. & Choisy, B. 2008. Selection of nesting habitat by Montagu's Harrier *Circus pygargus* and Hen Harriers *Circus cyaneus* in managed heaths. *Bird Study*, **55**, 86-93.
- Etheridge, B. and Summers, R. W. 2006. Movements of British Hen Harriers *Circus cyaneus*, outside the breeding season. *Ringing and Migration*, **23**, 6-14.
- Etheridge, B., Summers, R. W. & Green, R. E. 1997. The effects of human persecution on the population dynamics of Hen Harriers (*Circus cyaneus*) nesting in Scotland. *Journal of Applied Ecology*, **34**, 1081-1106.
- Fernández-Bellón, D. and Lusby, J., 2011. The feeding ecology of Merlin *Falco columbarius* during the breeding season in Ireland, and an assessment of current diet analysis methods. *Irish Birds*, **9**(2), pp.159-164.
- Flather, C. H. and Bevers, M. 2002. Patchy reaction-diffusion and population abundance: the relative importance of habitat amount and arrangement. *American Naturalist*, **15**, 40-56.
- Hardey, J., Crick, H., Wernham, C., Riley, H., Etheridge, B. and Thompson, D., 2009. *Raptors. A field guide for surveys and monitoring*. The Stationery Office, Edinburgh.
- Heavisides, A., 1987. British and Irish merlin recoveries, 1911–1984. *Ringing & Migration*, **8**(1), pp.29-41.
- Irwin, S., Wilson, M., Kelly, T. C., O'Mahoney, B., Oliver, G., Troake, P., Ryan, B., Cullen, C., O'Donoghue, B. & O'Halloran, J. 2011. The breeding biology of Hen Harriers *Circus cyaneus* in Ireland over a five year period. *Irish Birds*, **9**, 165-172.

- Irwin, S., Wilson, M., O'Donoghue, B., O'Mahony, B., Kelly, T. and O'Halloran, J., 2012. Optimum scenarios for Hen Harrier conservation in Ireland. FINAL REPORT, April 2012. Prepared for the Department of Agriculture, Food & the Marine. School of Biological, Earth & Environmental Sciences, University College Cork
- Mobiot, G. 2013. *The Naturalists Who Are Terrified of Nature*. Published online July 16th 2013. <http://www.monbiot.com/2013/07/16/the-naturalists-who-are-terrified-of-nature/> accessed November 22nd 2021.
- Millon, A., Bourrioux, J.-L., Riols, C. & Bretagnolle, V. 2002. Comparative breeding biology of Hen Harrier and Montagu's Harrier: an 8-year study in north-eastern France. *Ibis*, **144**, 94-105.
- New, L. F., Buckland, S. T., Redpath, S., & Matthiopoulos, J. 2011. Hen Harrier management: insights from demographic models fitted to population data. *Journal of Applied Ecology*, **48**, 1187-1194.
- O'Donoghue, B. 2010. *The Ecology and Conservation of Hen Harriers (Circus cyaneus) in Ireland*. Ph.D. Thesis, National University of Ireland, Cork.
- Petty, S. and Anderson, D. 1986. Breeding by Hen Harriers *Circus cyaneus* on restocked sits in upland forests. *Bird Study*, **33**, 177-178.
- Picozzi, N. 1984. Breeding biology of polygynous Hen Harriers (*Circus cyaneus cyaneus*) in Orkney. *Ornis Scandinavica*, **15**, 1-10.
- Rebecca, G. W., Cosnette, J.J.C, Hardey, J. and Payne, A., 1992. Status, distribution and breeding biology of the merlin in north-east Scotland, 1980-1989. *The Journal of the Scottish Ornithologists' Club*, **16**, pp.165-183.
- Redpath, S. M., Madders, M., Donnelly, E., Anderson, B., Thirgood, S., Martin, A. & McLeod, D. 1998. Nest site selection by Hen Harriers in Scotland. *Bird Study*. **45**, 51-61.
- Ruddock, M., Dunlop, B. J., O'Toole, L., Mee, A. & Nagle, T. 2012. Republic of Ireland National Hen Harrier Survey, 2010. *Irish Wildlife Manual*, No. 59. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.
- Ruddock, M., Mee, A., Lusby, J., Nagle, A., O'Neill, S. & O'Toole, L. 2016. *The 2015 National Survey of Breeding Hen Harrier in Ireland*. Irish Wildlife Manuals, No. 93. National Parks and Wildlife Service, Department of the Arts, Heritage and the Gaeltacht, Ireland
- Ruddock, M. and Whitfield, D.P. 2007. *A review of disturbance distances in selected bird species*. Inverness, UK: Scottish Natural Heritage
- Sansom, A., Evans, R. & Roos, S. 2016. *Population and future range modelling of reintroduced Scottish white-tailed eagles (Haliaeetus albicilla)*. Scottish Natural Heritage Commissioned Report No. 898.
- Simmons, R. E. 2000. *Harriers of the world*. Oxford University Press, Oxford.
- Simmons, R. E., Smith, P. C. & MacWhirter, R. B. 1986. Hierarchies among Northern Harrier (*Circus cyaneus*) harems and the costs of polygyny *Journal of Animal Ecology*, **55**, 755-771.
- Watson, D. 1977. *The Hen Harrier*. Poyser. Berkhamsted.

Whitfield, D. P., Fielding, A. H. & Whitehead, S. 2008. Long-term increase in the fecundity of Hen Harriers in Wales is explained by reduced human interference and warmer weather. *Animal Conservation*, **11**, 144-152.

Whitfield, D. P. and Fielding, A. H. 2009. *Hen Harrier Population Studies in Wales*. CCW (Countryside Council for Wales) Contract Science. Report No. 879 Countryside Council for Wales, Bangor.

Wilson, M. W., Gittings, T., O'Halloran, J., Kelly, T. C. & Pithon, J. 2006. *The distribution of Hen Harriers in Ireland in relation to land use cover, particularly forest cover*. COFORD, Dublin.

Wilson, M. W., Gittings, T., Pithon, J., Kelly, T. C., Irwin, S., & O'Halloran, J. 2012. Bird diversity of afforestation habitats in Ireland: current trends and likely impacts. In *Biology and Environment: Proceedings of the Royal Irish Academy* (pp. 55-68). Royal Irish Academy.

Wilson, M. W., Irwin, S., Noriss, D. W., Newton, S. F., Collins, K., Kelly, T. C. & O'Halloran, J. 2009. The importance of pre-thicket conifer plantations for nesting Hen Harriers *Circus cyaneus* in Ireland. *Ibis*, **151**, 332-343.

Wilson, M.W., O'Donoghue, B., O'Mahony, B., Cullen, C., O'Donoghue, T, Oliver, G., Ryan, B., Troake, P., Irwin, S., Kelly, T.C. and Rotella, J.J., 2012. Mismatches between breeding success and habitat preferences in Hen Harriers *Circus cyaneus* breeding in forested landscapes. *Ibis*, *154*(3), pp.578-589.