

Scottish Natural Heritage

Wind farm proposals on afforested sites –
advice on reducing suitability for hen harrier,
merlin and short-eared owl

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Scottish Natural Heritage Dualchas Nàdair na h-Alba

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1. Purpose

This guidance provides advice on measures to limit increased suitability of wind farm sites to hen harrier, merlin and short-eared owl in situations where forestry is being ‘opened up’. The aim of these measures is to limit any increase in collision risk to these species. The guidance also outlines ways to estimate the increased collision risk resulting from opening up forestry.

Closed canopy commercial forestry is not a favoured habitat for hen harrier, merlin or short-eared owl. However, opening up such forestry for wind farm development through ‘keyholing’¹, restructuring or clear-felling can create more suitable foraging and nesting habitat close to turbines. This may attract these birds into the wind farm site and increase the risk of collision mortality to levels above those predicted on the basis of pre-application survey (more on this at Section 5).

Much of our consultation advice for wind farm proposals in forestry sites relates to hen harrier, and this species is the key focus of this guidance. However the advice is still applicable to merlin and short-eared owl. (In the rest of this guidance, we collectively refer to these three species as “raptors”.)

The guidance is primarily aimed at developers and their ecological consultants. It replaces our previous guidance on *Post-construction management of wind farms on clear-felled forestry sites: reducing the collision risk for hen harrier, merlin and short-eared owl from Special Protection Areas* (2012).

Note that we would expect developers to devise turbine layouts that avoid the core foraging ranges around recorded nest sites of hen harriers. Where this is not possible, we would expect the developer to provide a clear, full justification for why this is the case, and measures to address this. We would also expect that none of the habitat management measures proposed should in their own right adversely affect the viability of the relevant raptor populations or of other sensitive bird species.

Proposals potentially affecting SPAs will require a Habitats Regulations Appraisal (HRA)². SPA birds need to be treated differently to wider countryside birds due to the requirements of the Habitats Regulations and HRA. Implementing any or all of these measures alone is not a guarantee that there will be no adverse effect on site integrity, due to the individual circumstances of each case.

Other planning and regulatory requirements will also need to be taken into account when considering what management is appropriate for the site, in particular:

- The Control of Woodland Removal Policy³;
- The UK Forestry Standard and Guidelines⁴;

¹ Keyholing involves creation of open areas around proposed turbines. The ‘keyhole’ size is typically 50m from turbine blade tip to forestry edge, and these keyhole areas usually remain open during the wind farm lifetime.

² <http://www.snh.gov.uk/protecting-scotlands-nature/protected-areas/international-designations/natura-sites/habitats-regulations-and-hra/>

³ <http://www.gov.scot/Topics/Business-Industry/Energy/Infrastructure/Energy-Consents/Guidance/Woodland-removal>

⁴ <http://www.forestry.gov.uk/ukfs>

- Water/ Waste Regulations⁵.

We would encourage developers to speak to FCS, SEPA, SNH and planning authority forestry officers (where they exist) about these issues at an early stage.

2. Background

Hen harriers nest on the ground, generally in drier, better drained conditions. They prefer to nest in tall vegetation with an open structure. They have been recorded nesting amongst deep heather, rushes, bracken, willow, moorland grass and mature bog myrtle. They will also nest in rank vegetation in clearings or rides within open and closed canopy plantations and restocked forestry. Short-eared owls have similar nest site requirements, preferring deep heather, tall rushes, grass or bracken. They are also known to nest in larger patches of young forestry. Merlin nest sites are more restricted to deep heather, but they will also use old crow nests both in more mature forestry blocks and in scattered trees on moorland.

The availability of prey in an area will also influence whether raptors choose to nest. Hen harriers prey primarily on small mammals, particularly short-tailed voles. They may also take rabbits and a wide range of birds, particularly meadow pipits. Short-eared owls feed mainly on small mammals in open habitats, while merlin specialise in catching small birds that they hunt over open ground, along forest edges, or sometimes over the canopy.

Following the completion of felling, ground vegetation typically regenerates quickly to produce a sward that is dominated by rank grass with small self-seeded trees. If left unmanaged, this can provide suitable nest sites for raptors, and habitat for their main prey.

3. Summary of advice on measures to help reduce suitability

Measures to help limit increased suitability of previously afforested areas are discussed in more detail at Section 6. In summary, these include:

- Manage ground vegetation height to 30cm or less in any permanent, large, open areas that are within 500m of turbines. This should help reduce the likelihood of nesting, and associated aerial courtship behaviour, around turbines. (See Section 6.1.)
- Plan forest restructuring in such a way as to reduce any open foraging corridors connecting existing breeding areas to proposed turbines. (See Section 6.2.)
- Employ measures to achieve more rapid canopy closure in any restocked areas close to turbines (e.g. replanting at higher stocking densities and targeted use of fertiliser). This would help reduce opportunities for both foraging and nesting by reducing the time that felled coupes remain open. (See Section 6.2.)
- Dissuade raptors from nesting close to turbines through human presence or artificial deterrents. This has been considered in some situations as a potential response to any significant increase in raptor activity detected by post-construction monitoring during the early breeding season. However we recommend that developers consider legal advice on this issue, and stop such activity if bird behaviour suggested a breeding attempt was likely. (See Section 6.3.)

⁵ <http://www.sepa.org.uk/regulations/land/forestry/>

- In some cases it may be possible to establish habitat enhancement areas to help attract birds away from turbines. However it should be recognised that the success of this is difficult to predict. (See Section 6.4.)
- Diversionary feeding has been considered by some developers in the event that hen harriers establish nests close to the proposed wind farm (e.g. within 2km). The context would be critical in assessing its effectiveness at attracting foraging activity away from proposed turbines. (See Section 6.5.)

4. How forestry felling and restructuring can affect suitability

Different approaches to forest felling and restructuring can have different effects on the subsequent attractiveness of the site to raptors and their prey. Some examples associated with wind farm proposals are:

- *Whole site clear-fell without replanting:* Unmanaged, this has the potential to create large areas of more suitable habitat close to turbines, which would be present for the lifetime of the wind farm. Clear-felling may also be associated with habitat restoration and creation measures, which, depending on the restored habitat type, can influence the suitability of the area for raptors and their prey.
- *Whole site clear-fell and replanting up to 'keyhole' areas:* Initial large-scale felling across the site is followed by subsequent replanting, but leaving permanent open keyholes around turbines (typically a 50m distance between the turbine blade tip and the forestry edge). This scenario initially results in a large area of more suitable habitat which would reduce over time as the replanted forestry around keyholes reaches thicket stage. Keyholes however remain as potentially suitable foraging and nesting opportunities.
- *Phased felling and restocking up to the keyholes:* Patches of the forest are felled and restocked in sequence following a forest management plan. This means that at any one time throughout the lifetime of the wind farm, the permanent keyhole areas close to turbines are surrounded by a patchwork of felled areas and trees of different age classes. This approach is likely to be the most compliant with the UK Forestry Standard⁶.

5. Methods of estimating post-felling collision risk

This section of the guidance outlines ways to estimate the increased collision risk resulting from opening up forestry. Guidance on assessing collision risk and the resultant significance of impacts can be found via the onshore wind page of our website⁷. However, standard methods, based on survey across closed canopy forestry, are likely to underestimate post-felling flight activity. We therefore provide some additional advice below on possible ways to address the likely underestimation of impacts. These are approaches that have been used to date in environmental assessments to estimate the post-felling collision risk. Other methods may be equally or more appropriate depending on the circumstances of each development:

⁶ <http://www.forestry.gov.uk/ukfs>

⁷ <http://www.snh.gov.uk/planning-and-development/renewable-energy/onshore-wind/>

- *Using flight activity data over non-forested areas of the survey area as a surrogate for future use of the felled areas:* Many proposed wind farm sites have both forested and non-forested areas within the survey area. It is therefore sometimes possible to use the flights recorded over the non-forested area as a surrogate for the area of forest to be felled. There is a risk, however, that this approach might lead to under or over-estimates of the future use at the felled site. This is likely to occur if the non-forested area is either of little use to raptors, or is of very good quality as foraging or nesting habitat. Careful consideration of the suitability of the surrogate area for foraging and/or nesting would therefore be required to ensure that the results are relevant to the area proposed for felling.
- *Using forest plans and flight activity data:* It may be possible to use the forest management plan to work out how the proportion of open, replanted and maturing areas within the forest will vary over time, when compared to the proportions at the time surveys are carried out. This could be combined with the flight activity recorded during survey to predict how site suitability and therefore flight activity may change during the lifetime of the wind farm.
- *Multiplying pre-felling collision risk over afforested areas by a factor to take account of increased use of site after felling:* Where the surveyed wind farm site is entirely afforested, the collision risks derived from the recorded flights have sometimes been multiplied by a factor to estimate the post-felling collision risks. This method can lead to over or under estimation of impacts. Therefore, rather than relying on estimating the potential collision rate, an alternative approach would be to work out by how much the flight activity would have to increase to adversely affect the population of the affected species. Judgement can then be applied as to how likely it would be that such an increase would occur.
- *Modelling of theoretical activity around known historical nest site locations:* This approach is only likely to be possible for proposals close to designated sites, where data on historical nesting locations is usually more readily available and relatively up to date. It is also useful to use where designated site populations may have been unfavourable, and nearby nest site occupation has been low, during the wind farm survey years. The typical distribution of flight activity around known nest centres can be used to model theoretical activity levels close to turbines. The activity levels can be adjusted to take account of the amount of proposed felling and the relative attractiveness of the felled areas compared with other available habitat (e.g. designated site moorland) also close to the nest sites. The theoretical collision risk can then be estimated based on the proportion of time that breeding raptors are likely to spend at collision risk height.

All of the above methods present challenges in data collection, modelling and interpretation. There is no empirical evidence to show how use of afforested sites by hen harrier, merlin or short-eared owl will change after felling. Conclusions usually require expert judgement. In particular, our advice should be sought for proposed developments that have connectivity to designated sites as well as those proposals where there is potential for significant impacts on the wider populations of these species (guidance on both these aspects is available⁸).

⁸<http://www.snh.gov.uk/planning-and-development/renewable-energy/onshore-wind/windfarm-impacts-on-birds-guidance/>

6. Our advice on measures to help reduce suitability

This section expands on the summary at Section 3, and describes in more detail the measures to help limit increased suitability in situations where forestry will be opened up during the lifetime of the wind farm.

6.1 Sward management

We recommend maintaining ground vegetation at less than 30cm height in any large, long-term, open areas (including keyholes) that are within 500m of turbines. Studies have shown that hen harriers infrequently nest in vegetation shorter than this (Redpath *et al*⁹). Tall vegetation such as heather, bracken, rushes and willows should also be cut back so as not to provide cover that would encourage nesting.

These measures should consequently discourage nesting close to turbines and so reduce the likelihood of display flights which may increase collision risk. The raptor species being considered here are likely to be particularly vulnerable to collisions when displaying close to nest sites. Associated food passes and prey deliveries to nests may also involve birds flying at collision risk height. These birds tend to be relatively less vulnerable when foraging because most foraging flights occur below the blade swept area of large-scale turbines. However it should be acknowledged that soaring and higher level 'commuting' flights may also be at collision risk height.

Our advice on managing the height of ground vegetation in the vicinity of wind turbines is aimed at reducing the availability of nesting cover, rather than reducing foraging suitability. This is because, unless the sward is kept significantly shorter than 30cm, it is unlikely to reduce the availability of the main prey species - for this, far more intensive management would be required i.e. maintaining a very short, uniform sward. So, in practice, focussing on reducing the availability of potentially suitable nesting habitat is likely to be the most practical form of management around wind farm sites.

We recognise that there are limitations on what sward management can achieve, particularly given the remaining potential for nesting in areas of young plantation and the remaining potential for foraging. Sward management may also be quite challenging from a practical point of view. Consideration should be given at an early stage as to how trees will be felled and removed, to ensure the post-felling ground conditions do not create unexpected difficulties. This will make management of these open areas easier, safer, and potentially cheaper, in the longer-term.

The best method(s) for managing vegetation at the required height is likely to vary from site to site. This will depend on, for example, the wider habitat restoration or creation objectives for the site, the topography, ground conditions, age of forestry being removed and habitats already present in open areas of the site. If grazing is proposed, manual or mechanical control of regenerating trees may still be required. This is because many of the seeds left by the forestry will germinate and grow before the sward has developed enough to allow grazing.

If mechanical cutting is proposed, it should be done over the autumn/early winter (from September) so as to be most effective. This should mean vegetation is most unsuitable in the immediate pre-breeding period (by mid-February), whilst allowing seeds to be naturally spread before cutting, encouraging habitat restoration. Cutting at this time should also avoid

⁹ Redpath S, Madders M, Donnelly E, Anderson B, Thirgood S, Martin A & Mcleod D. (1998) Nest site selection by hen harriers in Scotland, *Bird Study*, **45 (1)**, 51-61.

disturbing birds and any conflict with the Wildlife & Countryside Act (1981, as amended in Scotland). It is the responsibility of the person carrying out the activity to ensure that they comply with the law. More information on the law and wild birds is available¹⁰.

6.2 Forestry management

Restructuring may allow for some long-term retention of forestry between the wind farm site and an adjacent breeding area. Hen harriers are less likely to cross areas with tall trees when foraging and so this may help provide a barrier effect dissuading entry into the wind farm site. This may also be the case for short-eared owls, but is unlikely to influence the use of a site by merlin.

It may not be feasible to include such long-term retention, for example for landscape reasons or due to the likelihood of the retained trees being blown over by the wind. In such a situation, consideration should be given to phasing restructuring in a way as to reduce the creation of open corridors connecting the existing breeding areas to the wind farm site.

In restocked areas within 500m of keyholed turbines, the aim should be to achieve canopy closure as quickly as possible to reduce the opportunities for nesting. This can be done by, for example, replanting as soon as possible after felling, increasing the planting density, promptly replacing trees that have died shortly after planting, managing grazing pressure and applying fertiliser locally where required (following Forestry Guidelines).

6.3 Dissuasion by human presence and artificial deterrents

In addition to sward management, some developers have considered dissuasion by human presence in the early breeding season in response to any significant increase in raptor activity detected by post-construction monitoring. Developers have also proposed using artificial deterrents (such as gas guns and inflatables) to dissuade hen harrier from nesting.

We do not recommend *reliance* on deterrents as a means of mitigating the impacts on any wild bird species (see our advice on *Dealing with construction and breeding birds*¹¹). The effectiveness of artificial deterrents can be quickly undermined through habituation and are unlikely to present certainty in terms of mitigation.

These types of dissuasion may also be considered as harassment and an offence under the Wildlife & Countryside Act (1981, as amended in Scotland). Our guidance about the law and birds listed on Schedules A1 and 1A¹² notes that dissuading the birds from using areas with a high collision risk is considered unlikely to constitute an offence, but we recommended that developers consider legal advice before proposing any programme of dissuasion or deterrence if they have any uncertainties. We also advise stopping any such activity if behaviour suggested a breeding attempt was likely (e.g. intensive display, copulation, obvious pair of birds lingering in an area, etc.).

6.4 Habitat enhancement areas

In some locations it may be possible to manage habitat at some distance from proposed turbines to make it more suitable for foraging and/or nesting raptors (in comparison to areas closer to turbines). However it is important that such habitat is sufficiently far from the

¹⁰ <http://www.snh.gov.uk/protecting-scotlands-nature/protected-species/which-and-how/birds/>

¹¹ <http://www.snh.gov.uk/planning-and-development/renewable-energy/onshore-wind/windfarm-impacts-on-birds-guidance/>

¹² <http://www.snh.gov.uk/protecting-scotlands-nature/protected-species/which-and-how/birds/>

proposed turbines and provides a wide enough area of good quality foraging and nesting to help lure birds away. Records of where species have nested in the past may help identify which sites, if managed sympathetically, may be most readily occupied by raptors. Identifying features that birds tend to use when travelling between existing foraging areas and nest sites may help identify general areas suitable for enhancement. For example, it may be possible to widen flight corridors along streams to create enhanced foraging habitat. In most cases habitat enhancement areas should not be relied upon as mitigation due to the lack of certainty that the measures will be as successful as predicted. However such areas may help to reduce residual effects and could potentially be considered as planning gain. Sustainable forest management may in any case address such issues through inclusion of appropriate designed open ground in long-term forest plans.

6.5 Diversionsary feeding

Some developers have considered diversionsary feeding (see SNH, 2010¹³) for any hen harrier nest sites that become established close to turbines during the lifetime of the wind farm. This would be instigated at the start of each breeding season, and might be applied to any territories identified within 2km of the wind farm. Its primary purpose would be to reduce the need for hen harriers to actively forage away from the nest site. The likelihood of this being effective would need to be considered on a case by case basis.

Other information is available on how to carry out diversionsary feeding¹⁴. It is essential that there is discussion with SNH to explain how this would be done.

7. Considering residual risks

There are limitations and residual risks associated with each of the potential measures. It is important, therefore, that developers consider using more than one approach to produce a robust Habitat Management Plan (HMP), and fully justify their chosen approach(es).

For example, residual risks include:

- Hen harriers could potentially nest in swards shorter than 30cm, in restocked forestry before it reaches closed-thicket stage, or in such swards in forestry rides;
- Long-term retention of forestry may only represent a *partial* 'barrier' to flights from nearby established nesting areas;
- Dissuasion could be of limited effectiveness;
- The combined measures do relatively less to reduce potential for non-display type flights (a proportion of which would occur at collision risk height).

However, in our view, weighing up such risks, a combined package of measures, if carried out well, will help limit the potential for increased collision mortality when forestry is 'opened up'. Our consultation advice would take into account a judgement on likely effectiveness of proposed measures, and weigh this against other factors, including the estimated increase in collision mortality due to proposed felling.

¹³ SNH (2010). *Diversionsary feeding of hen harriers on grouse moors: a practical guide*. Scottish Natural Heritage, Battleby. <http://www.snh.gov.uk/publications-data-and-research/publications/search-the-catalogue/publication-detail/?id=1645>

¹⁴ <http://www.langholmproject.com/diversionsaryfeeding.html>

8. Other factors to consider

8.1 Impacts of habitat management on other interests

Management to reduce the suitability of a proposed wind farm site for raptors may create habitat that is suitable to other bird species which may then be at increased collision risk, or it have impacts on neighbouring habitats/ protected sites. For example, some wind farm proposals may be near to Special Areas of Conservation (SACs). Post-construction management aimed at reducing the use of the site by raptors must not have an adverse impact on habitat qualifying interests of the SAC – e.g. through the creation of adverse hydrological changes.

8.2 Forestry/ Habitat Management Plans

Information on forestry management associated with wind farm proposals should be contained in a Forest Management Plan (FMP). Where there will be a Habitat Management Plan (HMP) as well as a FMP, we recommend that the key elements of the FMP affecting raptors are cross referenced in the HMP. This is because the HMP should provide detail on the full range of habitat management measures and both Plans need to be complementary. Guidance on what to consider and include in HMPs can be found via the onshore wind page on our website¹⁵.

We also recommend that developers present information on the future management (or likely future management) of neighbouring forestry. This will help provide context, as sometimes neighbouring forestry management can undermine efforts to influence habitat suitability on the wind farm site itself.

8.3 Predator control

Nest predation can be a significant cause of mortality in hen harriers. Predator control may therefore be appropriate on some sites, particularly if this coordinates with other predator control measures that are underway (or are planned) across a neighbouring land holding/ designated site. Information is available on the legal requirements for predator control¹⁶.

8.4 Post-construction monitoring

We recommend that, for proposals connected to designated sites in particular, developers include post-construction monitoring to help assess what use, if any, hen harriers make of the wind farm area. (See our post-construction monitoring guidance¹⁷.) This may involve vantage point watches scheduled with sufficient hours, particularly during the early breeding season (March, April and May), to pick up any significant activity close to turbines. As discussed in our HMP guidance, post-construction monitoring should specifically address the HMP aims and objectives. Contingency plans need to be in place to adapt the management plan if its aims are not being met.

We recognise that there are data gaps and that more evidence needs to be gathered to help develop advice. As a result, it would be beneficial to the industry to increase the evidence base by publishing results in peer reviewed journals. The results of post-construction monitoring should be made available to the Scottish Windfarm Bird Steering Group¹⁸.

¹⁵ <http://www.snh.gov.uk/planning-and-development/renewable-energy/onshore-wind/>

¹⁶ <http://www.gov.scot/Topics/Environment/Wildlife-Habitats/paw-scotland/types-of-crime/Trappingsnaring>

¹⁷ <http://www.snh.gov.uk/planning-and-development/renewable-energy/onshore-wind/>

¹⁸ <http://www.swbsg.org/>

We also recommend that developers liaise with the local Raptor Study Group regarding any monitoring (to minimise disturbance to nesting raptors) and provide feedback to them on any nesting raptor monitoring by the consultants. All monitoring work will contribute usefully to increased knowledge and understanding of raptor use of wind farm sites, leading to more refined guidance and practical advice.

9. Roles in applying the guidance

The developer and/or their advisers should take the lead role in assessing the potential impacts and identifying appropriate management, and liaising with the relevant parties (e.g. SNH, SEPA, FCS, etc.). We will normally provide advice where there may be an adverse effect on the integrity of a designated site, or where significant adverse impacts are anticipated on wider populations of these raptors.

Further information on our engagement at different stages in the planning process can be found in our Service Statement¹⁹.

10. Providing feedback on this guidance

We welcome feedback on our guidance. If you have any suggestions on how to improve this guidance, or have any queries about it, please contact Paul Taylor at the address found on our website, or another member of the SNH Renewables Team²⁰.

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¹⁹ <http://www.snh.gov.uk/planning-and-development/approach/>

²⁰ <http://www.snh.gov.uk/planning-and-development/renewable-energy/contacts/>