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# Guidance on assessing the significance of impacts on bird populations from onshore wind farms that do not affect protected areas

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## Scope and purpose

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The purpose of this guidance is to assist with the assessments of terrestrial wind farm proposals where potential impacts do not affect notified interests or qualifying features of protected sites (SSSI, SPA or Ramsar sites).

This guidance is primarily directed at developers and their consultants and provides a framework for assessing impacts on bird populations within an environmental assessment or an environmental statement. It will also be useful for staff within NatureScot as well as consenting authorities when they are consulted on proposed developments. The assessment process is described here as well as setting out the information required to assess the significance of any impact on a species.

The guidance is not appropriate for the assessment of offshore wind farm developments, though there is potential for some species to be exposed to impacts from both onshore and offshore populations. In assessing cumulative impacts, the effects of offshore developments may need to be incorporated into onshore assessments for some species.

## [Legal context](#)

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The guidance takes account of the legal and policy obligations which apply where protected areas are not affected, including obligations under the [EU Birds Directive](#) and [Habitats Directive](#), the [Convention on Biological Diversity](#) (CBD), the [Scottish Biodiversity Strategy](#), and Scottish Government's Planning Guidance ([Scottish Planning Policy 2014](#)). [The Conservation \(Natural Habitats, &c.\) Amendment \(Scotland\) Regulations 2012](#)

update earlier versions of the Habitats Regulations and encompass devolved matters for Scotland's land and inshore waters. The amended Regulations require Competent Authorities to take the necessary steps to secure the preservation, maintenance or re-establishment of a sufficient diversity and area of habitats for wild birds in Scotland. This is generally known as the Bird Habitat Duty.

## **Introduction and background**

The number of onshore wind farm developments has increased markedly in recent years, resulting in an increasing need to identify impacts on habitats and species, particularly for birds inhabiting upland areas.

The potential impacts on bird populations are considered to be of particular concern because of their legal and conservation status and the effect that wind farms may have on their protection.

Wind farms can affect bird populations in four main ways:

- Direct mortality or injury from collision with turbine blades or towers.
- Loss of habitat due to construction of wind farm infrastructure.
- Displacement from the wind farm area (and potentially a wider zone surrounding the wind farm). Where displacement is an issue, we need to know the number of birds, or proportion of the population, that is likely to be displaced.
- Barrier effects if populations are prevented from reaching some destination due to wind farms acting as a barrier along the flight path.

## The assessment process

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Understanding the impact of a wind farm on bird species should follow a defined process. The stages in this process are as follows:

1. scoping the bird species that require assessment;
2. undertaking the survey work (see [Recommended bird survey methods to inform impact assessment of onshore wind farms](#));
3. quantifying the nature, direction and magnitude of impacts on the relevant species. This will be determined through an Environmental Statement (or Environmental Impact Assessment); and
4. assessing the significance of the likely impacts on these species and their populations. This should take into account any mitigation, compensation or enhancement measures that may be intended to eliminate or reduce such adverse impacts.

Key to the assessment of significance is the scale at which the likely impacts are assessed. Where species within protected areas are affected the scale is defined by the geographical extent of the protected area and the population within it. The issue of scale is addressed in detail later in this guidance.

Once the nature, direction and magnitude of an impact on a population has been quantified, an assessment must be made of its significance. This will depend on: the conservation status and sensitivity of the species and its supporting habitats; its abundance in the area; any special ecological role fulfilled by the site in question; and the resilience of the population in the face of potential losses. The assessment process will need to demonstrate that the proposed wind farm will not affect the maintenance (or recovery) of species' favourable conservation status. Wind farm developments that have an adverse effect on a species' conservation status may require amendment or mitigation included in the proposal or, in some exceptional cases, we may make an outright objection. We will only object to a proposal outside a protected area when we consider the consequences of an approval raise issues of national interest.

## Bird species that require assessment

All wild bird species are afforded a general level of protection through the Wildlife & Countryside Act 1981 (as amended) and the EU Birds Directive. There are specific obligations within the Birds Directive relating both to protection of species and maintenance of habitats. However, only some species are normally of concern, either because they are rare or vulnerable or they are dependent on habitats which are limited or subject to land use change. Birds on [Annex 1 of the Birds Directive](#) , regularly occurring migratory species, and birds on [Schedule 1 of the Wildlife & Countryside Act](#) are recognised in statute as requiring special conservation measures.

There are currently 22 species that are widespread across Scotland which utilise habitats or have flight behaviours that may be adversely affected by a wind farm. A further 13 'restricted range' species may be encountered in specific parts of the country. Lists of these species are provided in tables within Annex 1 to this guidance. The assessment within most wind farm Environmental Statements will be limited to species listed in these tables which occur within or around the proposed development site.

The non-statutory red list, also known as [Birds of Conservation Concern](#) (BoCC) presents a more comprehensive picture of birds whose populations are of conservation concern either generally or in parts of their natural range. While BoCC species may not have the legal protection afforded by the Birds Directive or the Wildlife & Countryside Act, such species may require assessment, where their conservation status is likely to be adversely affected by a wind farm development. Assessment of the impacts on birds arising from the development of a wind farm normally need not consider species not covered by the above categories.

## Favourable Conservation Status

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The significance of any wind farm impact on a bird species will depend on the nature, direction and magnitude of effects that arise from the development. A species' conservation status will also be influenced by the resilience of its population to perturbations, as well as the extent and suitability of its supporting habitats. Our response to any development proposal is guided by the overall aim of maintaining a viable population across the species' natural range along with a sufficient area of habitat (in line with the Bird Habitat Duty). This concept is encapsulated within the term 'favourable conservation status' as articulated within the EU's Habitats Directive.

A species' conservation status is taken as the sum of the influences acting on it which may affect its long-term distribution and abundance, within the geographical area of interest (which for the purposes of the Birds Directive is the EU). While the term 'favourable conservation status' is not used in the Birds Directive, EU court cases over recent years have progressively interpreted the concept as meaningful in a Birds Directive context. Favourable conservation status has also been used more recently within the [Environmental Liability Directive](#) as the basis of a test of environmental damage to protected species (including birds) and habitats.

A species' conservation status is favourable when:

- population dynamics indicate that the species is maintaining itself on a long-term basis and is therefore likely to persist in the habitat it occupies; and
- the natural range of the species is not being reduced, nor is likely to be reduced for the foreseeable future; and
- there is (and will probably continue to be) a sufficiently large habitat to maintain its populations on a long-term basis.

We recommend here that the concept of favourable conservation status of a species should be applied at the level of its Scottish population, to determine whether an impact is sufficiently significant to be of concern. An adverse impact on a species at a regional scale (within Scotland) may adversely affect its national conservation status (see Relevance of scale in assessments). This is a test which makes good ecological sense and maintains compatibility with the aims of European legislation and Government policy.

An impact should therefore be judged as of concern where it would adversely affect the existing favourable conservation status of a species or prevent a species from recovering to favourable conservation status, in Scotland.

## Relevance of scale in assessments

While the conservation status of a species can be assessed at a number of scales, our primary concern is on impacts on the Scottish (or international) population. We will not normally object to a wind farm proposal on account of purely local or regional impacts, provided these do not affect populations protected within a protected area.



Nonetheless, developments should be assessed, alone or in combination, at a regional (or analogous scale) for their impacts on a species population. However, the position NatureScot will adopt on the proposed development will depend on the significance of those impacts at the Scottish scale as set out in our National Interest guidance. An appropriate default regional scale for assessments is that of [Natural Heritage Zones](#) (NHZs) the boundaries of which have been drawn to reflect biogeographical differences between different zones, with a high level of environmental coherence within each zone. Where the wind farm site is close to the boundary of an NHZ, it may be desirable to consider possible impacts on the adjacent NHZ separately, especially if the species uses habitat within that NHZ or the species population is more strongly associated with that NHZ.

NHZ-level population estimates for a number of breeding bird populations and a number of estimates for key wintering waterfowl populations are available (Wilson et al., 2015). In some cases, such as wintering goose and swan populations that are highly mobile, it may be necessary to undertake assessment at a much broader scale such as that of the entire Scottish population. Passage migrants and some wintering populations may show high levels of movement within the non-breeding season and it is therefore difficult to define coherent regional populations with any confidence. This will be especially true where there is substantial site-based turnover in species' populations.

Alternative geographical areas to NHZs may be acceptable as the basis for assessment where there are definable regional or biogeographical populations that do not conform to NHZ boundaries (for example the distinct regional populations of red kites in Scotland)<sup>1</sup>. For some migratory species patterns of migration may determine the spatial scale at which impacts should be considered, e.g. corncrakes migrate up the west coast of Ireland and Scotland and any impacts during migration would be likely to affect the population as a whole. In considering a species' distribution, it is important to consider its distribution across its range.

<sup>1</sup> At the time of writing there are a number of distinct regional populations, mostly based on centres of release and re-introduction.

Regional populations may be of particular importance to a species conservation status at a national or international population because:

- they are core or 'stronghold' areas and the overall viability of the population is dependent on the maintenance of such areas; or
- they are 'edge of range' populations, which may (over time) be important in maintaining

For example, the Scottish golden eagle population encompasses areas that can be considered to be core and edge populations. The '[Golden eagle framework](#)' indicates the variation in vulnerability of the golden eagle in both core and edge of range areas to additional impacts, such as those from wind farms, across Scotland.

Biogeographical zone assessments are best applied where species have relatively stable distributions (such as during the breeding season) or where species occupy a habitat in the non-breeding season that is consistent and predictable.

## Information required to enable a view on significance

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Any assessment of the magnitude and potential significance of effects arising from wind farm developments will depend on:

- the size and direction (whether positive or negative) of the impact;
- the geographical extent of the impact, such as the habitat area lost from the effect of the proposed wind farm;
- the duration of the impact;
- the timing of the impact (which may only occur over part of the year or at particular stages in a species' life history); and
- whether the impact can be reduced or eliminated through reasonable mitigation or compensation.

It is necessary for such information to be included within the Environmental Statement, or other supporting material as a basis for assessing the significance of any impacts on the species at risk from the proposed wind farm development. Guidance on this is set out in section 5 of our [Bird Survey Guidance](#).

In some cases, appropriate population models will be helpful for putting effects into context. This will only be possible where suitable demographic data exists for the species concerned. In the majority of cases simple deterministic population models may be sufficient to quantify the significance of population impacts however more complex models do exist for some species. For example, a number of Population Viability Analyses (PVAs) are available for wintering populations of geese. These have been published as NatureScot commissioned reports giving levels of mortality above which populations will be at significant risk of declining.

PVAs generally require good long term data on numbers, as well as birth and death rates; i.e. information generally only available for a few species. Most PVA models developed thus far operate at the national level only, though in theory they can be extended to regional scales as long as good information exists on emigration and immigration rates. There is potential to develop other simpler models within the context of Species Frameworks. These will be helpful for a number of priority species (especially breeding raptors, such as hen harrier).

## Assessing whether impacts on bird species are significant

The Environmental Statement should set out the consequences for the integrity of the species population in terms of its size, trend, distribution (where known) and the area of suitable habitat.

The assessment should identify whether the impact is likely to adversely affect the conservation status of the species, by:

- preventing a recovering species from reaching favourable conservation status, at a national or international level; or
- changing a species' status from favourable to unfavourable; or
- for a species that is already in decline, the assessment should focus on whether the proposal would undermine the potential for halting its decline and allowing it to recover to favourable conservation status.

Our decision on whether to object or not will be dependent on the conclusions that arise from the above decisions. We will provide advice where impacts may be amenable to successful mitigation or other measures that will limit adverse impacts.

The

[Institute of Ecology and Environmental Management \(IEEM\)](#)

Guidelines provides useful guidance on assessing ecological impacts. While we no longer use generic percentage thresholds or percentage loss of species, we do recommend that any assessment broadly follows the principles set out in the IEEM Guidance. This takes into account the ecology of the species, current status and trend. Where possible, developers and their consultants should consider using population modelling to put potential impacts in context.

In order to assess significance, information is also needed on the number, trends and distribution of each species at the relevant regional and national geographical scales, as well as natural mortality and productivity where available. Data on demographic parameters can be accessed from the [BTO Bird Facts](#) web page. Where full information is not available, consideration should also be given to what reasonable judgements can be made on available information, taking a precautionary approach where levels of uncertainty are high. National population estimates may be obtained from the latest Avian Population Estimates Panel (APEP) report ( [Musgrove et al., 2013](#) ), and Scottish estimates from ' [The Birds of Scotland](#) ' (Forrester et al. 2007).

## Cumulative effects

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An Environmental Statement should include a cumulative impact assessment. Cumulative effects are considered to be additive. The purpose of a cumulative impact assessment is to examine if the effect of a number of developments in combination is significant, regardless of whether individual proposals have a significant effect or not. Cumulative impacts should be assessed at the relevant biogeographical scale, such as the NHZ, so that the assessment of the impact of the development can be made alone and in combination with other developments. We have published guidance on assessing cumulative effects of wind farms in "[Assessing the Cumulative Impact of Onshore Wind Energy Developments](#)".

## Mitigation, compensation and enhancement

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Mitigation, compensation and/or enhancement are all measures that may limit or offset adverse impacts that might arise from a wind farm development. Minimising or eliminating adverse impacts will reduce their significance and, as such, should be part of the assessment process.

Mitigation is recommended as this reduces or eliminates an adverse impact. The effect of any mitigation proposed should be incorporated into assessment of the predicted environmental impact. Where impacts cannot be mitigated, compensation measures (e.g. habitat creation) that offset adverse impacts should be considered. Enhancement may also be possible as part of any compensation measures. These go beyond simply offsetting an adverse impact by adding benefit.

Mitigation may take one or more of the following approaches:

- Avoiding adverse impacts: mitigation to avoid impacts could involve redesign, micro-siting or the removal of either individual or clusters of turbines to reduce collision risk or displacement effects.
- Reducing unavoidable adverse impacts: a potentially significant effect can be reduced by shutting down turbines during peak periods of flight activity, again either for individual or clusters of turbines.
- Habitat management measures: reducing the attractiveness of areas close to turbines.

Compensatory measures may be undertaken on or off the development site (i.e. within or outwith the footprint of the wind farm proposal) and could include habitat works to create similar environmental conditions to those which may be affected. It will be important to consider whether such measures are realistic and/or achievable, and the timescale of realising their environmental benefits.

Enhancement means that there will be a net additional benefit to the natural heritage. Measures could include the provision of new habitats or habitat features on land that is adjacent to, or near, the wind farm. Improvements to existing management practices might also be incorporated into any management plan.

Mitigation is best considered at an early stage. Developers should set out their proposed approach to mitigation in the Environmental Statement once effects on species populations are known. The nature of any mitigation and a suitably detailed proposal will be required in order to demonstrate its practicality, its likelihood of succeeding and any known constraints that may influence success (such as land ownership considerations). Where the proposal is for a wind farm located within a forestry plantation, consider what information will be required to understand the impacts of the forest felling and future management, and whether this means that a forest management plan should be included as part of the proposal.

When evaluating mitigation measures, consideration needs to be given to:

- Whether mitigation is both practical and deliverable.
- Whether mitigation for one natural heritage aspect will impact on another.
- Whether there is a need for the mitigation to be implemented and whether its effectiveness will be demonstrated before the wind farm is built.
- What monitoring will be undertaken and how will it inform ongoing management action.



The benefits of habitat enhancement measures proposed may also be taken into account in any final judgement made by NatureScot, but should not obscure conclusions on the expected impacts of the proposal.

Where there are impacts arising on site, we expect the developer to follow the natural heritage mitigation hierarchy, namely:

- Avoid - for example, in the timing and methods of construction
- Minimise - for example, by limiting the duration or intensity of an activity
- Reinstate - improve impacted habitats towards restoring function
- Compensation - where impacts cannot be avoided, minimised or reinstated toward onsite restoration, well planned and implemented off-site compensation for biodiversity enhancement should be discussed with us and the Local Planning Authority.'

## Monitoring after consent has been granted

The outcome of certain forms of mitigation action may be subject to uncertainty. It will therefore be important to consider how and when mitigation will be monitored and whether a feedback loop needs to be built in to enable mitigation measures to be modified to ensure aims are met. It is for the Competent Authority to ensure (enforce) that mitigation is delivered. We will normally advise the Competent Authority that an independent ecological clerk of works should be appointed to oversee and report on the mitigation schemes.

An increasing proportion of wind farm developments are consented and constructed with mitigation schemes and monitoring requirements as consent conditions. In order to inform future developments, it will be very important for monitoring outcomes to be made publicly available through the Consenting Authority within agreed timescales. Such information will be the key, both for NatureScot and the industry, to understand the residual effects of wind farms on the natural heritage, particularly on bird species, and to understand the effectiveness of mitigation measures.

It has often proven difficult to encourage developers and their consultants to provide and share data from constructed wind farm sites, especially where mitigation measures have been adopted. Mindful of the need to protect commercial confidentiality in some circumstances, we strongly encourage developers to share data and experience with other developers, statutory agencies, NGOs and by researchers undertaking independent research on the impacts of wind farms on birds.

## References

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## Annex 1: Priority bird species for assessment when considering the development of onshore wind farms in Scotland

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**Table A1: Widespread species potentially at risk of impacts from onshore wind farms. These species are likely to be found at many wind farm sites and should be considered at scoping as possible species that may be present.**

<b>Widespread Species</b>	<b>Breeding/wintering</b>	<b>EU Birds Directive: Annex 1</b>	<b>EU Birds Directive: Migratory</b>	<b>WCA Schedule 1</b>	<b>BOCC Red List</b>	<b>Notes</b>
Red-throated diver	Br	yes	yes	yes	-	-
Black-throated diver	Br	yes	yes	yes	-	-

Whooper swan	W	yes	yes	yes	-	-
Greylag goose	Br/W	-	yes	-	-	-
Pink-footed goose	W	-	yes	-	-	-
Greenland and whitefronted goose	W	yes	yes	-	yes	White-fronted goose is red listed. Declines in this subspecies are also significant
Barnacle goose	W	yes	yes	-	-	-
Red kite (reintroduced population)	Br/W	yes	-	yes	-	Key issues are fostering

ion)						range recover y and mainte nance of pioneer ing pairs
Hen harrier	Br/W	yes	-	yes	yes	-
Goshawk	Br/W	-	-	yes	-	-
Golden eagle	Br/W	yes	-	yes	-	-
Osprey	Br	yes	yes	yes	-	-
Merlin	Br/W	yes	-	yes	yes	-
Peregrine falcon	Br/W	yes	-	yes	-	-
Black grouse	Br/W	-	-	-	yes	-
Golden plover	Br	yes	yes	-	-	-
Lapwing	Br	-	-	-	yes	-
Dunlin	Br	yes	yes	-	yes	<i>C.a.</i>

						<i>schinzii</i> is the breedin g sub- specie s
Curlew	Br	-	yes	-	yes	-
Greens hank	Br	-	yes	yes	-	-
Herring gull	Br/W	-	yes	-	yes	-
Short- eared owl	Br/W	yes	-	-	-	-

**Table A2: Species with ‘restricted ranges’ potentially at risk of impacts from onshore wind farms. These species have a very restricted distribution and are unlikely to be found on many proposed wind farm sites. Their presence should be established through discussion with relevant staff in NatureScot, at scoping.**

<b>Restri cted Range Specie s</b>	<b>Breedi ng/win tering</b>	<b>EU Birds Directi ve: Annex 1</b>	<b>EU Birds Directi ve: Migrat ory</b>	<b>WCA Sched ule 1</b>	<b>BOCC Red List</b>	<b>Notes</b>
Slavoni an grebe	Br	yes	yes	yes	yes	-

Bean goose	W	-	yes	-	-	-
Honey buzzard	Br	yes	yes	yes	-	-
White-tailed eagle (reintroduced population)	Br/W	yes	-	yes	yes	Key issues are fostering range recovering and maintenance of pioneering pairs
Marsh harrier	Br/W	yes	yes	yes	-	-
Corncrake	Br	yes	yes	yes	yes	-
Whimbrel	Br	-	yes	yes	yes	-
Arctic skua	Br	-	yes	-	yes	-
Great skua	Br	-	yes	-	-	-

Nightjar	Br	yes	yes	-	yes	-
Chough	Br/W	yes	-	yes	-	-
Scottish crossbill	Br/W	yes	-	yes	-	-
Capercaillie	Br/W	yes	-	yes	yes	-