

AGENDA ITEM 5

APPENDIX 2

2019/0120/DET

HABITATS REGULATIONS APPRAISAL

SNH NATURA APPRAISAL PROFORMA: CONSTRUCTION OF 47 HOUSES AND FLATS ON LAND 80M SE OF 2 CARR PLACE, CARRBRIDGE

Appraisal in Relation to Regulation 48 of the Conservation (Natural Habitats, &C.) Regulations 1994 as Amended¹ (Habitats Regulations Appraisal)

Casework Management System Ref.

CDM155382

NATURA SITE DETAILS

Name of Natura site(s) potentially affected:

1. Abernethy Forest SPA (Current)
2. Anagach Woods SPA (Current)
3. Cairngorms SPA (Current)
4. Craigmore Wood SPA (Current)
5. Kinveachy Forest SPA (Current)

Name of component SSSI if relevant:

1. Abernethy Forest SPA: Abernethy Forest SSSI
2. Anagach Woods SPA: Anagach Woods is not designated as a SSSI
3. Cairngorms SPA: Glenmore Forest, Cairngorms, Northern Corries and North Rothiemurchus Pinewood SSSIs.
4. Craigmore Wood SPA: there is no SSSI underpinning Craigmore Wood
5. Kinveachy Forest SPA: Kinveachy Forest SSSI

Natura qualifying interest(s) & whether priority/non-priority:

- 1. Abernethy Forest SPA**
Capercaillie (*Tetrao urogallus*)
Osprey (*Pandion haliaetus*)
Scottish crossbill (*Loxia scotica*)
- 2. Anagach Woods SPA**
Capercaillie (*Tetrao urogallus*)
- 3. Cairngorms SPA**
Capercaillie (*Tetrao urogallus*)
Merlin (*Falco columbarius*)
Osprey (*Pandion haliaetus*)
Golden eagle (*Aquila chrysaetos*)
Dotterel (*Charadrius morinellus*)
Scottish crossbill (*Loxia scotica*)
Peregrine (*Falco peregrinus*)
- 4. Craigmore Wood SPA**
Capercaillie (*Tetrao urogallus*)
- 5. Kinveachy Forest SPA**
Scottish crossbill (*Loxia scotica*)

¹ Or, where relevant, under regulation 61 of The Conservation of Habitats and Species Regulations 2010 as amended, or regulation 25 of The Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007 as amended.

Capercaillie (*Tetrao urogallus*)

Conservation objectives for qualifying interests:

1. Abernethy Forest SPA

To avoid deterioration of the habitats of the qualifying species (listed below), or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and to ensure for the qualifying species that the following are maintained in the long term:

- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species
- Population of the species as viable component of the site

Osprey (*Pandion haliaetus*)

Scottish crossbill (*Loxia scotica*)

Capercaillie (*Tetrao urogallus*)

2. Anagach Woods SPA

To avoid deterioration of the habitats of the qualifying species (listed below), or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and to ensure for the qualifying species that the following are maintained in the long term:

- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species
- Population of the species as viable component of the site

Capercaillie (*Tetrao urogallus*)

3. Cairngorms SPA

To avoid deterioration of the habitats of the qualifying species (listed below), or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and to ensure for the qualifying species that the following are maintained in the long term:

- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species
- Population of the species as viable component of the site

Scottish crossbill (*Loxia scotica*)

Dotterel (*Charadrius morinellus*)

Golden eagle (*Aquila chrysaetos*)

Peregrine (*Falco peregrinus*)

Osprey (*Pandion haliaetus*)

Merlin (*Falco columbarius*)

Capercaillie (*Tetrao urogallus*)

4. Craigmore Wood SPA

To avoid deterioration of the habitats of the qualifying species (listed below), or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and to ensure for the qualifying species that the following are maintained in the long term:

- Distribution of the species within site
 - Distribution and extent of habitats supporting the species
 - Structure, function and supporting processes of habitats supporting the species
 - No significant disturbance of the species
 - Population of the species as viable component of the site
- Capercaillie (Tetrao urogallus)

5. Kinveachy Forest SPA

To avoid deterioration of the habitats of the qualifying species (listed below), or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and to ensure for the qualifying species that the following are maintained in the long term:

- Distribution of the species within site
 - Distribution and extent of habitats supporting the species
 - Structure, function and supporting processes of habitats supporting the species
 - No significant disturbance of the species
 - Population of the species as viable component of the site
- Capercaillie (Tetrao urogallus)
Scottish crossbill (Loxia scotica)

STAGE 1: WHAT IS THE PLAN OR PROJECT?

Proposal title:

Construction of 47 houses and flats, associated roads and footways at land 80m SE of 2 Carr Place, Carrbridge

Date consultation sent:

3 May 2019

Date consultation received:

3 May 2019

Name of consultee:

CNPA (planning application called in)

Name of competent authority:

CNPA

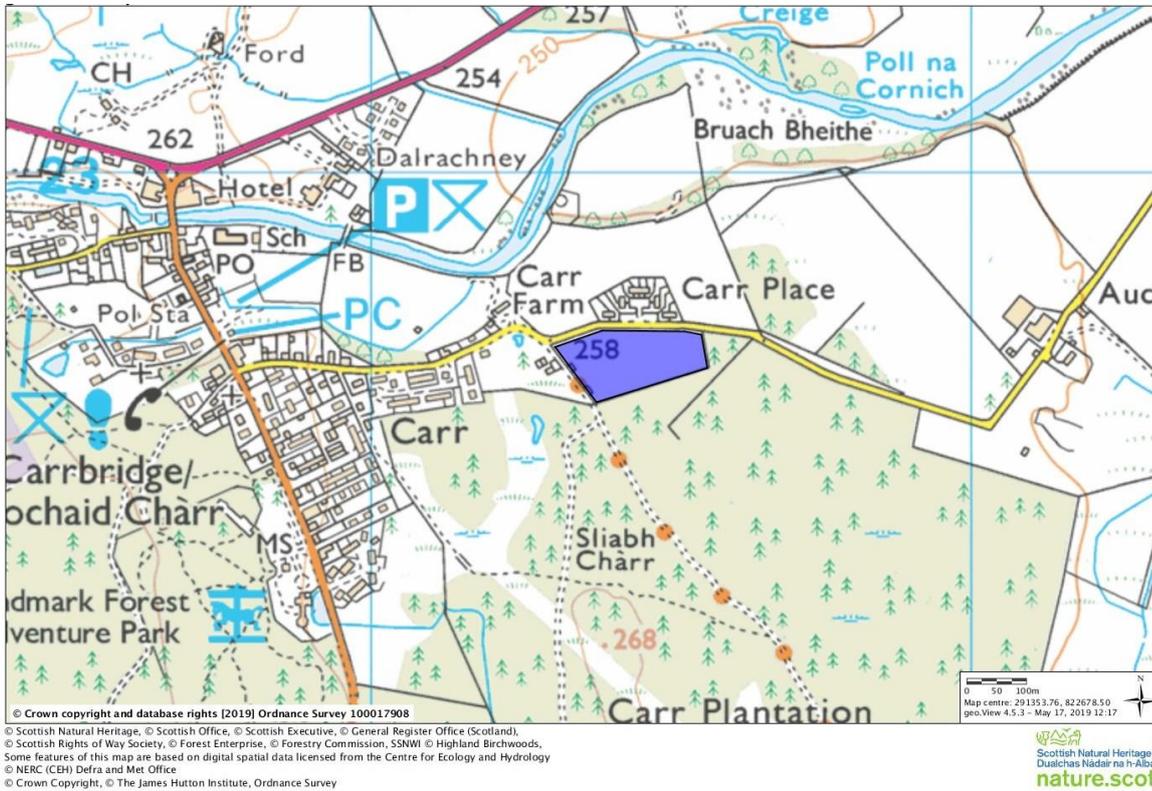
Type of case:

Planning

Details of proposal (inc. location, timing, methods):

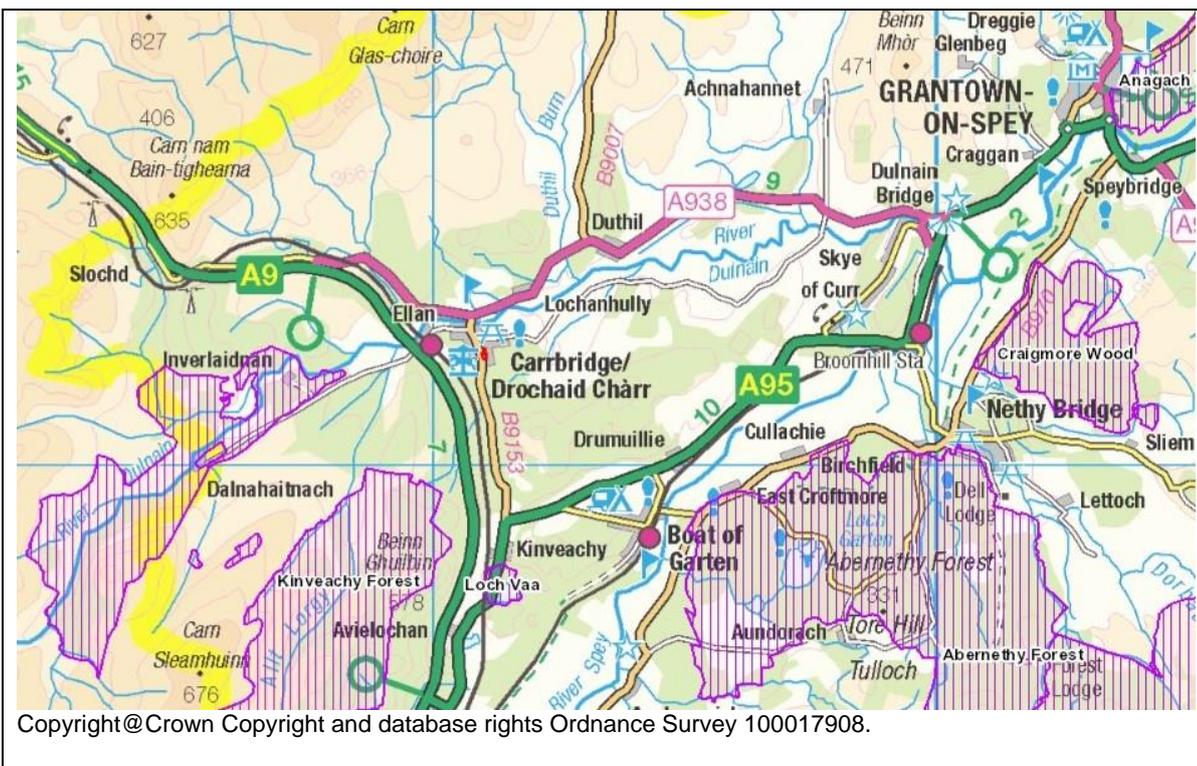
The application is for 45 houses and flats, with associated roads and footways. The site lies on Carr Road to the east of Carrbridge, within the Cairngorms National Park. The application will provide mixed housing, with two, three, four and five bedroom bungalows, flats and villas.

The location of the site is shown on the map below, based on information provided by the developers. It is at NH 914226.



The distance between the development and the surrounding SPAs is shown below. The distances are approximately:

- Anagach Woods SPA: 12 km
- Cairngorms SPA 9.0 km
- Kinveachy Forest SPA 3 km
- Abernethy Forest SPA 5 km
- Craigmore Wood SPA 9 km



STAGE 2: IS THE PLAN OR PROJECT DIRECTLY CONNECTED WITH OR NECESSARY TO SITE MANAGEMENT FOR NATURE CONSERVATION?

No.

STAGE 3: IS THE PLAN OR PROJECT (EITHER ALONE OR IN COMBINATION WITH OTHER PLANS OR PROJECTS) LIKELY TO HAVE A SIGNIFICANT EFFECT ON THE SITE?

- 1. Capercaillie.
Yes. The proposal risks increasing disturbance to capercaillie, and disturbance to capercaillie can have a knock-on effect on the population in the SPAs. For this reason, there is a likely significant effect.
- 2. Scottish crossbill, osprey, dotterel, golden eagle, merlin, osprey and peregrine falcon.
No. The proposal would have no effect, either direct or indirect, on any of these species within the SPAs classified for them.

Mitigation or modifications required to avoid a likely significant effect & reasons for these:

| | |
|--------------------|----------------|
| <i>Mitigation:</i> | <i>Reason:</i> |
|--------------------|----------------|

STAGE 4: UNDERTAKE AN APPROPRIATE ASSESSMENT OF THE IMPLICATIONS FOR THE SITE IN VIEW OF ITS CONSERVATION OBJECTIVES

Effects of proposal on the conservation objectives of the SPAs

| Conservation objective | Proposal | Conclusion |
|---|---|--|
| Distribution of the species within site | The development would have no effect of the distribution of capercaillie within any of the SPAs, because it is too far away from them. | No impact on the integrity of the site for this objective. |
| Distribution and extent of habitats supporting the species | There would be no change in the distribution and extent of habitats supporting the species because there would be no actions affecting habitat. | No impact on the integrity of the site for this objective. |
| Structure, function and supporting processes of habitats supporting the species | There would be no change in the structure, function and supporting processes of the pine woodland, because the development is a distance away from the sites, and there would be no indirect effects. | No impact on the integrity of the site for this objective. |
| No significant disturbance of the species | Disturbance is considered below. | See below. |
| Population of the species as viable component of the site | This depends partly on the indirect effects of disturbance. This is considered below. | See below. |

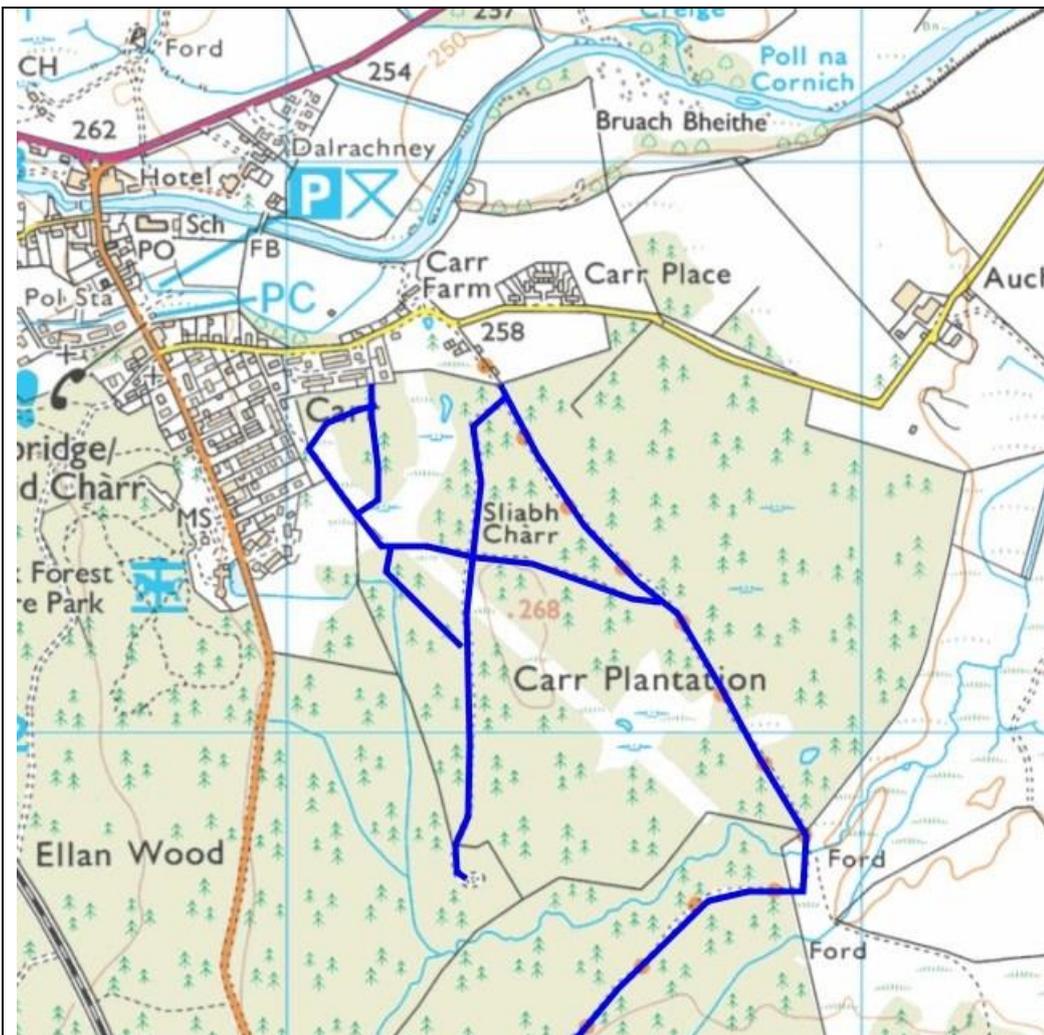
It is concluded that disturbance is the key issue potentially arising from this development.

Disturbance

The ecological basis for assuming that capercaillie are vulnerable to disturbance, and the effects of disturbance on a meta-population species, can be found in Appendix 1 and 3 below.

Carrbridge has an estimated 792 people, based on the results of the 2011 census by settlement zone (Highland Council 2014). Assuming an average of three people per household, the proposed 45 households would lead to a likely increase of approximately 135 people. There is another housing development in Carrbridge currently underway with 25 units – assuming 2 people per household on average, this would add another 50 people. This gives a total of 977. The increase with both developments is approximately 23%.

The map below show the network of paths close to the proposed development. Paths are shown in blue, the Sustrans cycle route is shown in purple.



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Footpaths directly link with this development site and hence into the wider woodland. There is a good network of informal paths in Carr Plantation, which would meet people's needs for short and medium length walks. The woodland is attractive and the paths pleasant to use.

The area around the proposed development site is not known to be used by capercaillie, due to the intensity of existing disturbance or unsuitability of the habitat. Short walks will therefore not have any negative effect on capercaillie.

There are additional paths which are available for longer walks, most of which do not go very close to capercaillie areas. Those which do go close to areas used by capercaillie have good tracks and there is no strong reason for people to leave the tracks.

For all these reasons, it is concluded that the potential disturbance arising from this development is not likely to have any measurable effect on capercaillie. There would therefore be no impact on the integrity of the designated sites.

STAGE 5: CAN IT BE ASCERTAINED THAT THE PROPOSAL WILL NOT ADVERSELY AFFECT THE INTEGRITY OF THE SITE?

It is concluded that there is no impact on the integrity of the SPAs from the proposed

development, because people's recreational needs would be met by the existing network of high quality paths and there would be no additional disturbance arising from the development.

Mitigation or modifications required to ensure adverse effects are avoided, & reasons for these.

| | |
|--------------------|----------------|
| <i>Mitigation:</i> | <i>Reason:</i> |
|--------------------|----------------|

ADVICE SOUGHT

| |
|--|
| |
|--|

CONCLUSION/ADVICE IN RELATION TO PLAN OR PROJECT

When SNH is advising the competent authority

Natura model response position:

| |
|--|
| Likely significant effect, but no impact on the integrity of the designated sites. |
|--|

Development management response type:

| |
|-------------|
| Advice only |
|-------------|

| | |
|---------------------|--------------|
| Appraised by | Anne Elliott |
| Date | 17 May 2019 |
| Checked by | |
| Date | |

Appendix 1: Sensitivity of capercaillie to recreational disturbance

Text taken from HRA for Local Development Plan, see A2355975.

Disturbance can affect capercaillie by reducing the availability of otherwise suitable habitat (including habitat used for roosting, feeding, nesting and brood rearing), displacing the birds from leks, disrupting behaviour patterns and increasing the risk of predation. These effects can occur separately or additively. Capercaillie are sensitive to disturbance at all life stages but especially so when attending leks, incubating eggs (late April to mid-June) or rearing broods (late May - late August but critically during June and July when the chicks are small and dependent on the hen for warmth).

Research has recorded numerous examples of individuals reacting to disturbance, for example through short-term changes in behaviour and long-term shifts in habitat use, however, population-level effects are difficult to demonstrate so their importance remains unclear (Storch, 2013). Reported responses include a decline in local capercaillie numbers (Brenot *et al.*, 1996 cited in Thiel *et al.*, 2007) and abandonment of lek sites (Labigand & Munier, 1989 cited in Thiel *et al.*, 2007).

Much of the continental European research on this subject has focussed on disturbance from off-path recreational use. A study of the behavioural response of capercaillie to off-trail hikers

demonstrated that flushing distance varied between male and female birds, visibility of hiker, intensity of winter tourism, and hunting pressure (Thiel *et al.*, 2007). Males tended to flush at greater distances than females and longer flushing distances were recorded in more open woodland. Birds also flushed more easily in areas with high intensity of winter tourism or hunting pressure compared to undisturbed areas. The authors noted that the unpredictable nature of off-trail tourism meant that birds are less likely to habituate to it. The mean flushing distance in this study was 27 ± 0.6 m (SE, n = 752; range 1 – 104 m) and 90% of all flushing events were at less than 50 m. The authors recommended the establishment of regulations requiring hikers to stay on trails and closing trails where inter-trail distances fall below 100m. An example of such management in the Bayerischer Wald National Park, Bavaria, resulted in capercaillie returning to the surrounding woodland (Scherzinger 2003 cited in Summers *et al.*, 2007).

A recent radio-telemetry study in south-western Germany found that whilst outdoor recreation did not affect home range selection, strong effects on habitat use within the home range were detected. Distance to recreation infrastructure (e.g. hiking and cross-country skiing trails, ski pistes) was the main determinant of habitat selection in winter; in summer, mountain bike trails and hiker's restaurants were avoided up to an average distance of 145m (CI: 60-1092m). Relative avoidance of winter-infrastructure, was recorded up to 320m (CI: 36-327m), this reduced when dense understory provided visual cover. Between 8- 20% (summer) and 8- 40% (winter) of the population area was affected by outdoor recreation (Coppes *et al.* 2017).

Capercaillie need to compromise between shelter and outlook. A study by Finne and co-workers (Finne *et al.*, 2000) indicated that males prefer good cover at the expense of a good overview of the surrounding area when selecting daytime roosting sites. They noted that to be suitable as male habitat, areas surrounding capercaillie leks should contain forest with a high vertical cover close to the ground, i.e. with low canopies. They indicated that this could be achieved by thinning young even aged plantations at an early stage, or rejuvenating forests by selection cutting and natural regeneration instead of clear felling and planting. Habitat structure has been shown to modify the alert distance of a number of bird species, with increasing bird tolerance associated with greater availability of escape cover (Fernandez-Juricic *et al.*, 2001). In the specific case of capercaillie, Thiel and co-authors (2007) recommended planting or preserving evergreen conifer trees in dense rows along critical parts of disturbance sources thus reducing the degree of visibility between capercaillie and recreationists – this would increase the habitat available to capercaillie in forests with predictable recreation activities.

In the UK, expert opinion also states that capercaillie in Scotland are adversely affected by recreational disturbance and that disturbance is most critical during lekking and brood rearing times (Marshall, 2005). This report, which was based on the opinions of 15 experts, suggested a minimum 75 m buffer for exclusion of human activity at known leks but recognised the need for more field-based empirical research. This report also emphasised the potential impact of dogs not under control in capercaillie areas. The experts considered that uncontrolled dogs can cause severe disturbance to capercaillie during the lek and breeding season (p19). Nearly 75% of the expert responses relating to walking a loose dog rated this activity as causing the highest (>75m) level of disturbance (p7).

A more recent report (Ruddock & Whitfield, 2007) also collated the views of experts and calculated the median alert distance (AD) and flight initiation distance (FID) for the species as ascertained from expert opinion, and these are tabulated below.

| Alert distance | | | |
|----------------|--------------------------|-------------|-------------------|
| | Median distance (metres) | Sample Size | 80% range values* |
| (metres) | | | |
| Incubating | 75 | 11 | <10 – 150 |
| Chick rearing | 75 | 4 | <10 - 150 |
| Lekking | 125 | 9 | 100 - 750 |

* The 80% range value is the range in opinion values after the lower 10% and upper 10% of opinions were excluded.

| Flight initiation distance | | Sample Size | 80% range values* |
|----------------------------|--------------------------|-------------|-------------------|
| (metres) | Median distance (metres) | | |
| Incubating | 5 | 11 | <10 – 100 |
| Chick rearing | 30 | 5 | <10 - 50 |
| Lekking | 75 | 5 | 50 - 500 |

* The 80% range value is the range in opinion values after the lower 10% and upper 10% of opinions were excluded.

In Scotland, research on recreational disturbance has provided evidence of the effects of paths and tracks on capercaillie. Summers and co-workers (2004) found that in winter capercaillie avoided woodland close to tracks and suggested that human disturbance may displace capercaillie and reduce the amount of woodland available. This led them to suggest that removal or closure of tracks might benefit capercaillie and a further study was undertaken. This follow-on study in four forests stands at Glenmore and Abernethy also concluded that the use of trees by capercaillie was lower close to tracks (Summers *et al.*, 2007). The authors estimated that 21-41% of woodland may be avoided by capercaillie as a result of disturbance and again recommended that unnecessary tracks should be removed, re-routed, or their promotion and maintenance reduced.

A separate study which used droppings as an inexpensive way of mapping the distribution of capercaillie at a fine-grained resolution in three woodlands in Badenoch & Strathspey, found that disturbance within a few hundred metres of woodland entrances was so great that ground there was little used by capercaillie. Beyond this, disturbance associated with tracks deterred capercaillie from a belt of ground at least 140 m wide, up to 470 m where people and dogs strayed off tracks (Moss *et al.*, 2014).

In summary, capercaillie are vulnerable to disturbance. They nest on the ground and their most vulnerable stage is considered to be as eggs or chicks. At this stage, they can be directly killed by dogs, or killed by predators such as crows when the hen is flushed from the nest or brood, or killed by exposure if a hen is flushed. Capercaillie are also vulnerable to disturbance on the lek. Some cock birds become over-aggressive and lose their fear of humans, but the vast majority of males are very easily driven away. Adult birds can fly away from disturbance and to that extent, are less vulnerable than eggs and chicks. However, even adult birds can be vulnerable to collapse and death in winter. This is thought to happen when the weather is windy and wet, because in winter they mostly eat low calorie Scots pine needles, and exposure plus repeated disturbance may mean that they run out of energy. The precise ways in which disturbance from people and dogs affect different aspects of capercaillie ecology (e.g. courtship, breeding, rearing, dispersal, foraging, winter energy expenditure) are, however, not fully understood.

Appendix 2: Links between the SPAs, and between the SPAs and non-designated woodlands in Badenoch and Strathspey

After a period of rapid and significant decline (Eaton *et al.*, 2007) the national population of capercaillie has been estimated to be between 1000 and 2000 birds by each national survey undertaken since the first in 1992 - 1994. Thus, the national population is small and remains vulnerable. Conservation of capercaillie requires consideration at the metapopulation scale as well as at the scale of individual sites.

The Badenoch & Strathspey meta-population is the key population in the UK (Poole, 2010), holding around 75% of the estimated national population (Ewing *et al.*, 2012). Within Badenoch & Strathspey there are five SPAs with capercaillie as a qualifying interest: Abernethy Forest; Anagach

Woods; Craigmore Wood; Cairngorms; and Kinveachy Forest. The distances between these SPAs are well within maximum capercaillie dispersal distances known from the literature. These are:

- Storch (1995) radio-tracked 40 capercaillie in the Bavarian Alps and found that throughout the year distances of females from the leks they attended in spring averaged 1.3 km (Standard Error = 0.1 km). In winter and spring males aggregated within a 1 km radius of the lek, but dispersed within a 3 – 4 km radius during summer;
- Storch (2001 cited in Moss *et al.*, 2006) concluded that most males settle close to their chick range but young female dispersal distances were typically 5 – 10 km;
- A radio-tracking study of males at leks in Russia and Norway recorded average dispersal distance of males to summer range of 2.3 km, SE = 0.37 (Russia 2.2 km, SE = 0.70; Norway 2.4 km, SE = 0.43) (Hjelford *et al.*, 2000)
- Storch & Segelbacher (2000) summarised known movements as average seasonal movements of 1 – 2 km for adults and median dispersal distances of < 10 km for juveniles;

The distances recorded in a Scottish study (Moss *et al.*, 2006) are somewhat longer than those above, and this may be related to the fragmented nature of Scottish forests compared with those on the continent, or possible incomplete natal dispersal in some of the Storch studies:

- the natal or first-winter dispersal distances of 13 hens radio-tracked by Moss *et al.* (2006) ranged within 1 – 30 km (median: 11, mean 12.3, SD 9.8).

We conclude that effects on the capercaillie population in any one of these SPAs could potentially affect the population in the others. Similarly, the effects on the capercaillie population within undesignated woods in Badenoch & Strathspey could affect the populations in the five SPAs.

Appendix 3: References:

Coppes, J., Ehrlicher, J., Suchant, R. & Braunisch, V. (2017). Outdoor recreation causes effective habitat reduction in Capercaillie *Tetrao urogallus*: a major threat for geographically restricted populations. *Journal Avian Biology* doi:10.1111/jav.01239

Eaton, M.E., Marshall, K.B. & Gregory, R.D. (2007) Status of Capercaillie *Tetrao urogallus* in Scotland during winter 2003/4. *Bird Study* 54: 145 – 153.

Ewing, S.R., Eaton, M.A., Poole, T., Davies, M., & Haysom, S. (2012) The size of the Scottish population of capercaillie *Tetrao urogallus*: results of the fourth national survey. *Bird Study* Vol.59(2): 126 – 138.

Fernandez-Juricic, E., Jimenez, M.D. & Lucas, E. (2001) Alert distance as an alternative measure of bird tolerance to human disturbance: implications for park design. *Environmental Conservation* 28(3): 263 – 269.

Finne, M.H., Wegge, P., Eliassen, S. & Odden, M. (2000) Daytime roosting and habitat preferences of capercaillie *Tetrao urogallus* males in spring – the importance of forest structure in relation to anti-predator behaviour. *Wildlife Biology* 6(4): 241 – 249

Hjelford, O., Wegge, P., Rolstad, J., Ivanova, M. & Beshkarev, A.B. (2000) Spring-summer movements of the male capercaillie *Tetrao urogallus*: A test of the 'landscape mosaic' hypothesis. *Wildlife Biology* 6(4): 251 – 256.

Highland Council (2014) Report No NBS/02/14 Population Change in Nairn and Badenoch & Strathspey 2001 to 2011, by Director of Planning and Development.

Marshall K. (2005). Capercaillie and recreational disturbance study. Unpublished report for CNPA, FCS and SNH.

- Moss, R., Picozzi, N., Catt, D.C. (2006). Natal dispersal of capercaillie *Tetrao urogallus* in northeast Scotland. *Wildlife Biology* 12(2): 227 – 232.
- Moss, R., Leckie, F., Biggins, A., Poole, T., Baines D. & Kortland, K. (2014) Impacts of human disturbance on capercaillie *Tetrao urogallus* distribution and demography in Scottish woodland. *Wildlife Biology* 20: 1 - 18.
- Picozzi, N., Catt, D.C. & Moss, R. (1992). Evaluation of capercaillie habitat. *Journal of Applied Ecology* 29: 751 - 762.
- Poole, T. (2010). Capercaillie conservation in Scotland – importance of Strathspey metapopulation. Unpublished report.
- Ruddock, M. & Whitfield, D.P. (2007). A Review of Disturbance Distances in Selected Bird Species. A report from Natural Research (Projects) Ltd to Scottish Natural Heritage.
- Scherzinger, W. 2003. Artenschutzprojekt Auerhuhn in Nationalpark Bayerischer Wald von 1985 – 2000. Nationalpark Bayerischer Wald. Wissenschaftliche Reihe – Heft 15.
- Storch, I. (1995) Annual home ranges and spacing patterns of capercaillie in Central Europe. *Journal of Wildlife Management* 59(2): 392 – 400.
- Storch, I. (2013) Human disturbance of grouse - why and when? *Wildlife Biology*, 19(4):390-403.
- Storch, I. & Segelbacher, G. (2000). Genetic correlates of spatial population structure in central European capercaillie *Tetrao urogallus* and black grouse *T. tetrix*: a project in progress. *Wildlife Biology* 6(4): 305 – 310.
- Summers, R. W., McFarlane, J., & Pearce-Higgins, J. W. (2004). Measuring Avoidance of Woodlands Close to Tracks by Capercaillies in Scots Pine Woodland. Report to Forestry Commission Scotland, Scottish Natural Heritage and the Royal Society for the Protection of Birds.
- Summers, R. W., McFarlane, J. & Pearce-Higgins, J.W. (2007) Measuring avoidance by capercaillies *Tetrao urogallus* of woodland close to tracks. *Wildlife Biology* 13(1): 19 – 27
- Summers, R. W., Proctor, R., Thornton, M. & Avey, G. (2004) Habitat selection and diet of the Capercaillie *Tetrao urogallus* in Abernethy Forest, Strathspey, Scotland. *Bird Study* 51: 58 – 68.
- Thiel, D., Menoni, E., Brenot, J.-B. & Jenni, L. (2007) Effects of recreation and hunting on flushing distance of capercaillie. *The Journal of Wildlife Management* 71(6): 1784 – 1792.
- Thiel, D.T., Jenni-Eidemann, S., Palme, R., Jenn, L. (2011) Winter tourism increases stress hormone levels in the Capercaillie *Tetrao urogallus*. *Ibis* (2011), 153, 122–133

