

Supplementary Materials

Table S1. Full attribution for bird images in Figure 1 under Creative Commons licenses. Bird species are listed left to right from panel (d) in Figure 1. All images were sourced from www.wikimedia.org and cropped from the original image. Author web links are provided where a functional user page or personal homepage were listed. Bird species were checked to be the correct sub-species for the study site.

	Creative Commons attribution			
Bird in Figure 1d	Title	Author	Source	License
Cuckoo (<i>Cuculus canorus</i>)	Kukolo	GabrielBuissart	https://commons.wikimedia.org/wiki/Cuculus_canorus#/media/File:Cuculus_canorus2.jpg	CC BY-SA 3.0
Curlew (<i>Numenius arquata</i>)	Eurasian Curlew	Andreas Trepte	https://commons.wikimedia.org/wiki/Numenius_arquata#/media/File:Eurasian_Curlew.jpg	CC BY-SA 2.5
Grey Partridge (<i>Perdix perdix</i>)	Poland	Marek Szczepanek	https://commons.wikimedia.org/wiki/Perdix_perdix#/media/File:Perdix_perdix_2_(Marek_Szczepanek).jpg	CC BY-SA 4.0
Herring Gull (<i>Larus argentatus</i>)	Larus argentatus, Herring Gull, taken in St. Ives, Cornwall, UK	Stu's Images	https://commons.wikimedia.org/wiki/File:Larus_argentatus_Herring_Gull_Cornwall_2.JPG#/media/File:Larus_argentatus_Herring_Gull_Cornwall_2.JPG	CC BY-SA 3.0
House Sparrow (<i>Passer domesticus</i>)	A male House Sparrow in Germany	Adamo	https://commons.wikimedia.org/wiki/Passer_domesticus#/media/File:Passer_domesticus_male_(15).jpg	CC BY 2.0 de
Lapwing (<i>Vanellus vanellus</i>)	Northern Lapwing	Andreas Trepte	https://commons.wikimedia.org/wiki/Vanellus_vanellus#/media/File:Northern-Lapwing-Vanellus-vanellus.jpg	CC BY-SA 2.5
Linnet (<i>Linaria cannabina</i>)	Common Linnet, a male, in breeding plumage at Mazères, Ariège, France	Pierre Dalous	https://commons.wikimedia.org/wiki/Linaria_cannabina#/media/File:Linotte_m%C3%A9lodieuse.jpg	CC BY-SA 3.0
Mistle Thrush (<i>Turdus viscivorus</i>)	Mistle Thrush in the Netherlands.	Gerard Blokhuis	https://commons.wikimedia.org/wiki/Turdus_viscivorus#/media/File:Turdus_viscivorus_-_Netherlands-8.jpg	CC BY 3.0
Skylark (<i>Alauda arvensis</i>)	Feldlerche im Frühling, Brutvogel im NSG Bislicher Insel	Frebeck	https://commons.wikimedia.org/wiki/Alauda_arvensis#/media/File:Feldlerche_Fr%C3%BChling_NSG.jpg	CC BY-SA 3.0
Song Thrush (<i>Turdus philomelos</i>)	Song Thrush	Andreas Trepte	https://commons.wikimedia.org/wiki/Turdus_philomelos#/media/File:Song_Thrush_Turdus_philomelos.jpg	CC BY-SA 2.5
Starling (<i>Sturnus vulgaris</i>)	Common Starling (<i>Sturnus vulgaris vulgaris</i>), Leek Wootton, Warwickshire	Charles James Sharp	https://commons.wikimedia.org/wiki/Sturnus_vulgaris#/media/File:Common_Starling_Leek_Wootton,_Warwickshire_(Sturnus_vulgaris).jpg	CC BY-SA 4.0

Table S2. Birds recorded on Ilkley Moor (Harris et al., 2020) with Birds of Conservation Concern (BoCC) designations (Eaton et al., 2015; JNCC, 2020). All species have been recorded in the 5 year period 2015-2019, apart from those in bold and underlined, which were recorded on site in the 10 year period 2009-2019. All other species have been recorded in Contains JNCC/NE/NRW/SNH/NIEA data © copyright and database right 2019.

Common/ latin name	BoCC* 4 classification	Common name	BoCC* 4 classification
Cuckoo <i>Cuculus canorus</i>	Red	Canada Goose <i>Branta canadensis</i>	Green
Curlew <i>Numenius arquata</i>	Red	Carrion Crow <i>Corvus corone</i>	Green
Grasshopper Warbler <i>Locustella naevia</i>	Red	Chaffinch <i>Fringilla coelebs</i>	Green
Grey Partridge <i>Perdix perdix</i>	Red	Chiffchaff <i>Phylloscopus collybita</i>	Green
Herring Gull <i>Larus argentatus</i>	Red	Coal Tit <i>Parus ater</i>	Green
House Sparrow <i>Passer domesticus</i>	Red	Collared Dove <i>Streptopelia decaocto</i>	Green
Lapwing <i>Vanellus vanellus</i>	Red	Domestic Pigeon <i>Columba livia domestica</i>	Green
Linnet <i>Linaria cannabina</i>	Red	Golden Plover <i>Pluvialis apricaria</i>	Green
Mistle Thrush <i>Turdus viscivorus</i>	Red	Goldfinch <i>Carduelis carduelis</i>	Green
Skylark <i>Alauda arvensis</i>	Red	Great Spotted Woodpecker <i>Dendrocopos major</i>	Green
Song Thrush <i>Turdus philomelos</i>	Red	Great Tit <i>Parus major</i>	Green
Starling <i>Sturnus vulgaris</i>	Red	Greenfinch <i>Chloris chloris</i>	Green
Tree Sparrow <i>Passer montanus</i>	Red	Grey Heron <i>Ardea cinerea</i>	Green
Black-headed Gull <i>Chroicocephalus ridibundus</i>	Amber	Hobby <i>Falco subbuteo</i>	Green
Bullfinch <i>Pyrrhula pyrrhula</i>	Amber	Jackdaw <i>Coloeus monedula</i>	Green
Dunnock <i>Prunella modularis</i>	Amber	Jay <i>Garrulus glandarius</i>	Green
Great Black-backed Gull <i>Larus marinus</i>	Amber	Little Owl <i>Athene noctua</i>	Green
Greylag Goose <i>Anser anser</i>	Amber	Long-tailed Tit <i>Aegithalos caudatus</i>	Green
House Martin <i>Delichon urbicum</i>	Amber	Magpie <i>Pica pica</i>	Green
Kestrel <i>Falco tinnunculus</i>	Amber	Moorhen <i>Gallinula chloropus</i>	Green
Lesser Black-backed Gull <i>Larus fuscus</i>	Amber	Pheasant <i>Phasianus colchicus</i>	Green
Mallard <i>Anas platyrhynchos</i>	Amber	Pied Wagtail <i>Motacilla alba</i>	Green
Meadow Pipit <i>Anthus pratensis</i>	Amber	Raven <i>Corvus corax</i>	Green
Oystercatcher <i>Haematopus ostralegus</i>	Amber	Red Kite <i>Milvus milvus</i>	Green
Red Grouse <i>Lagopus lagopus</i>	Amber	Red-legged Partridge <i>Alectoris rufa</i>	Green
Short-eared Owl <i>Asio flammeus</i>	Amber	Robin <i>Erithacus rubecula</i>	Green
Snipe <i>Gallinago gallinago</i>	Amber	Rook <i>Corvus frugilegus</i>	Green
Stock Dove <i>Columba oenas</i>	Amber	Sedge Warbler <i>Acrocephalus schoenobaenus</i>	Green
Swift <i>Apus apus</i>	Amber	Sparrowhawk <i>Accipiter nisus</i>	Green
Willow Warbler <i>Phylloscopus trochilus</i>	Amber	Barn Swallow <i>Hirundo rustica</i>	Green
Bar-headed Goose <i>Anser indicus</i>	Not listed in BoCC 4.	Treecreeper <i>Certhia familiaris</i>	Green
Blackbird <i>Turdus merula</i>	Green	Wheatear <i>Oenanthe oenanthe</i>	Green
Blackcap <i>Sylvia atricapilla</i>	Green	Whitethroat <i>Sylvia communis</i>	Green
Blue Tit <i>Cyanistes caeruleus</i>	Green	Woodpigeon <i>Columba palumbus</i>	Green
Buzzard <i>Buteo buteo</i>	Green	Wren <i>Troglodytes troglodytes</i>	Green

Table S3. Parameters giving the best out-of-bag (OOB) Root Mean Square Error (RMSE) for all RF models using hyper-tuning.

Model	Variables available for splitting at each node (mtry)	Node size	Sample size	OOB prediction error (MSE)	R squared (OOB)
All visitors	12	3	0.8	2.56	0.97
Environmentally aware	10	3	0.8	1.20	0.96
Environmentally ambiguous	11	3	0.8	0.36	0.97

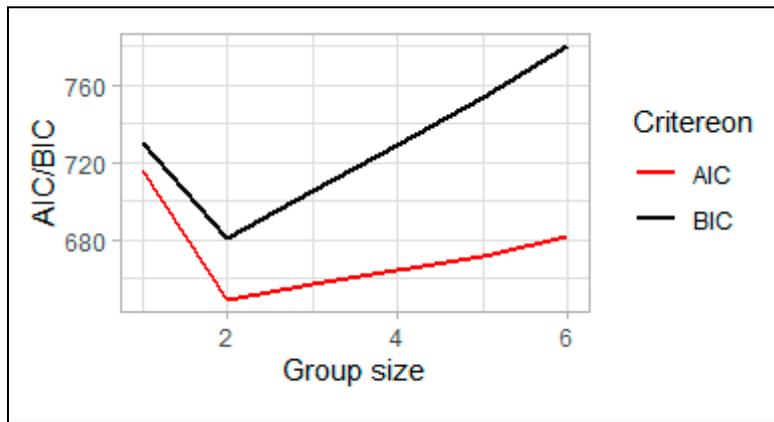


Figure S1. Latent Class Analysis (LCA) AIC and BIC for multiple group (class) sizes. A group size of 2 was selected due to the having the lowest AIC/BIC.

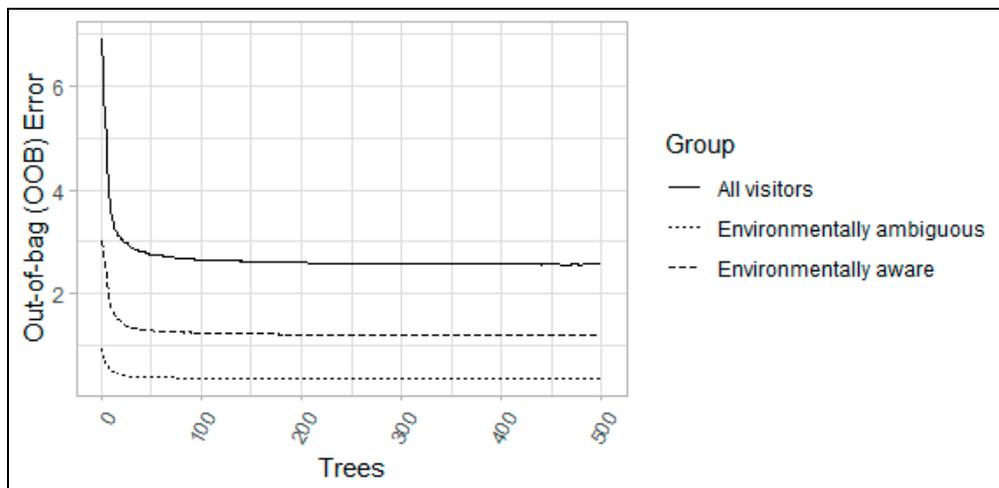


Figure S2. Random Forest tree out-of-bag (OOB) stabilisation of for Random Forest models. The plot shows the error rate stabilises by 100 trees.

References

Eaton, M., Aebischer, N., Brown, A., Hearn, R., Lock, L., Musgrove, A., Noble, D., Stroud, D., Gregory, R., Powell, R., 2015. Birds of Conservation Concern 4: the population status of birds in the UK, Channel Islands and Isle of Man, © British Birds.

Harris, S.J., Massimino, D., Balmer, D.E., Eaton, M.A., Noble, D.G., Pearce-Higgins, J.W., Woodcock, P., Gillings, S., 2020. The Breeding Bird Survey 2019 (No. BTO Research Report 726). Thetford.

JNCC, 2020. Conservation Designations for UK Taxa 2020 [WWW Document]. URL <https://hub.jncc.gov.uk/assets/478f7160-967b-4366-acdf-8941fd33850b>