BTO RESEARCH REPORT 799

Modelling population-level impacts of wind farm collision risk on Welsh Red Kites: populations functionally linked to two Special Protection Areas.

An addendum to Research Report 766.

Hannah F. R. Hereward, Callum J. Macgregor, Owain Gabb, Alice Connell, Robert J. Thomas, Anthony V. Cross & Rachel C. Taylor

BTO Birds Science People

ACKNOWLEDGEMENTS: Contains Natural Resources Wales information © Natural Resources Wales and Database Right. All rights Reserved. Contains Ordnance Survey Data. Ordnance Survey Licence number AC0000849444. Crown Copyright and Database Right.

Modelling population-level impacts of wind farm collision risk on Welsh Red Kites: populations functionally linked to two Special Protection Areas.

An addendum to Research Report 766.

Hannah F. R. Hereward, Callum J. Macgregor, Owain Gabb, Alice Connell, Robert J. Thomas, Anthony V. Cross & Rachel C. Taylor

BTO Research Report 799

BTO, The Nunnery, Thetford, Norfolk IP24 2PU
Tel: +44 (0)1842 750050 Email: info@bto.org
Registered Charity Number 216652 (England & Wales), SC039193 (Scotland).

ISBN 978-1-912642-99-1

Birds Science People

Contents

Introduction

In a previous study, we modelled the impacts of the creation of additional wind energy capacity in Wales on Red Kite *Milvus milvus* populations at different spatial scales, including those of two Special Protection Areas (SPAs) which are designated for the species (Hereward *et al*. 2024). SPA populations were modelled both as the number of birds nesting within the SPA boundary, and separately as the number of birds nesting within the SPA or within 2 km of its boundary. The latter follows a definition used in the original designation of the Elenydd–Mallaen SPA (CCW 2008a), which reflects the probability that birds nesting in the vicinity of the SPA boundary will be functionally linked to the SPA, for example by foraging within it.

More recent advice suggests that the median 'core range' of a breeding Red Kite has a radius of 4 km (Scottish Natural Heritage 2016). This value is now widely used in decision-making in place of the original 2-km buffer, to determine likely functional linkages to the SPA.

The present analysis was conducted as an addendum to Hereward *et al*. (2024), in order to additionally model impacts on SPA populations as the number of birds nesting within the SPA or within 4 km of its boundary, better reflecting the current policy landscape.

Methods

This analysis uses the same methods as Hereward *et al*. (2024). New scenarios have been modelled for the two focal SPAs (Elenydd–Mallaen SPA and Berwyn SPA), which consider a 4-km buffer zone around the SPA boundaries.

Hereward *et al*. (2024) outlined that the population estimates for the two SPAs were larger than the maximum number of nests recorded in these areas during the 14 years of intense nest recording (2000–2013) undertaken by the Welsh Kite Trust, and that this was to be expected since Red Kite nests can be hard to detect, so there are likely to be more pairs present than nests recorded. This remains true when considering the SPA populations to include birds nesting within a 4-km buffer zone around the SPA boundary. We estimate some 268 pairs to be nesting within the Elenydd–Mallaen SPA plus 4 km, and 15 pairs within the Berwyn SPA plus 4 km. By comparison, peak counts of nests in the equivalent areas from the Welsh Kite Trust dataset were 120 nests (in 2011) for the Elenydd–Mallaen SPA, and six nests (in 2006) for the Berwyn SPA.

Table 1: Baseline (2022) Red Kite population estimates for relevant spatial areas, estimated using data from Bird Atlas, APEP4 and the BTO/JNCC/RSPB Breeding Bird Survey, and used as a starting point in Population Viability Analysis (PVA) modelling.

Category	Spatial boundary	Population estimate	
		(pairs)	(adults)
Wales	Wales national boundary	2,117	4,234
SPA	Berwyn SPA plus 2-km buffer	10	19
	Berwyn SPA plus 4-km buffer	15	30
	Elenydd–Mallaen SPA boundary	79	158
	Elenydd–Mallaen SPA plus 2-km buffer	179	359
	Elenydd–Mallaen SPA plus 4-km buffer	268	536
Area Statement areas	North West Wales	99	198
	North East Wales	3	5
	Mid Wales	1,488	2,975
	South West Wales	468	937
	South Central Wales	22	45
	South East Wales	9	18

Results

Estimated impacts of the wind energy development scenarios on the Elenydd–Mallaen and Berwyn SPAs are comparably small when each SPA is considered to include all pairs within a 4-km buffer (Figure 1) as were those originally reported by Hereward *et al.* (2024). For the SPAs plus 4-km buffer, the probability of a population decline as a result of all proposed wind farms ultimately being commissioned (the most extreme scenario) was slightly lower than the equivalent estimate for the SPAs plus 2-km buffer: 0.3% probability of decline in the Berwyn SPA population (compared to 0.4% with a 2-km buffer zone) and 3.3% probability of decline in the Elenydd–Mallaen SPA population (compared to 4% with a 2-km buffer zone) (Figure 2). As reported in Hereward *et al.* (2024), although impacts upon population trends appear relatively small, these may propagate into substantial differences in population size given enough elapsed time (Figure 3).

Figure 1: Projected impacts of all currently proposed wind farm developments in combination at a range of outcome scales. The recent Red Kite population trend (from BBS trend for Wales) is shown in blue. Baseline (unimpacted) population projections are shown in yellow, and the impacted population projections are shown in grey. For all line colours, dotted/dashed lines and shading (blue and yellow only) show 95% confidence intervals. Panels show projections at different outcome scales: a) Berwyn SPA (from Hereward *et al.* 2024); b) Berwyn SPA plus 2-km buffer (from Hereward *et al.* 2024); c) Berwyn SPA plus 4-km buffer; d) Elenydd–Mallaen SPA (from Hereward *et al.* 2024); e) Elenydd–Mallaen SPA plus 2-km buffer (from Hereward *et al.* 2024); f) Elenydd–Mallaen SPA plus 4-km buffer. Note the y-axis is shown on a logarithmic scale.

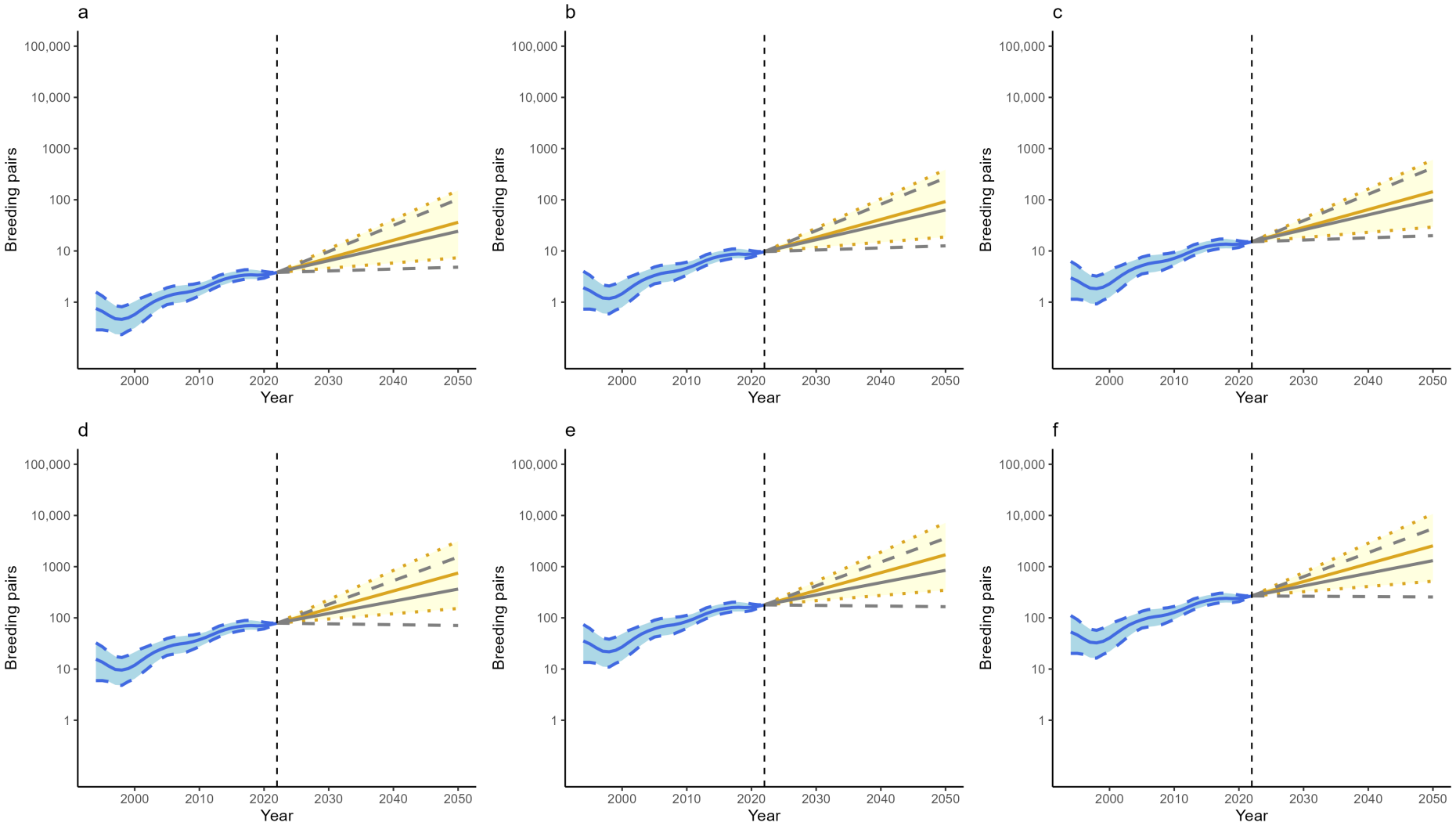


Figure 2: Relative probabilities of different population outcomes for all currently proposed wind farm developments in combination at a range of outcome scales. In each panel, the impacted scenario (right) is compared to the unimpacted baseline (left). Outcomes are grouped into high, medium and low rates of population increase (shaded in dark green, light green and yellow respectively); population stability (shaded blue) and population decline (shaded grey). Panels show probabilities at different outcome scales: a) Berwyn SPA (from Hereward *et al.* 2024); b) Berwyn SPA plus 2-km buffer (from Hereward *et al.* 2024); c) Berwyn SPA plus 4-km buffer; d) Elenydd–Mallaen SPA (from Hereward *et al.* 2024); e) Elenydd–Mallaen SPA plus 2-km buffer (from Hereward *et al.* 2024); f) Elenydd–Mallaen SPA plus 4-km buffer.

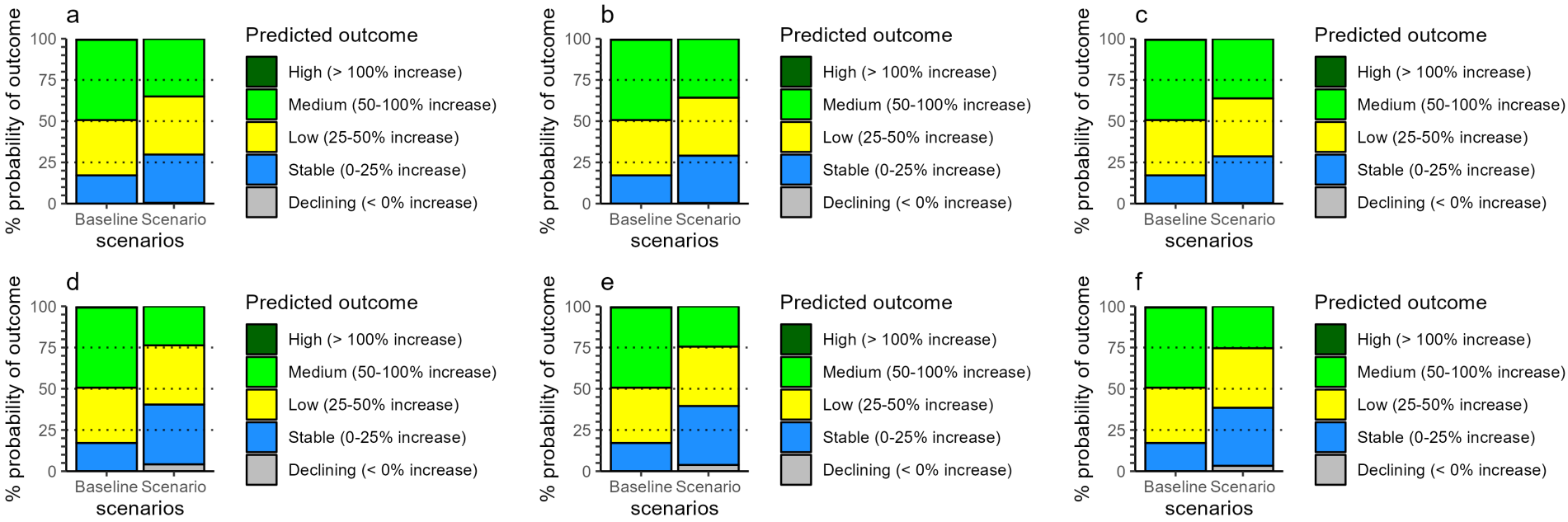
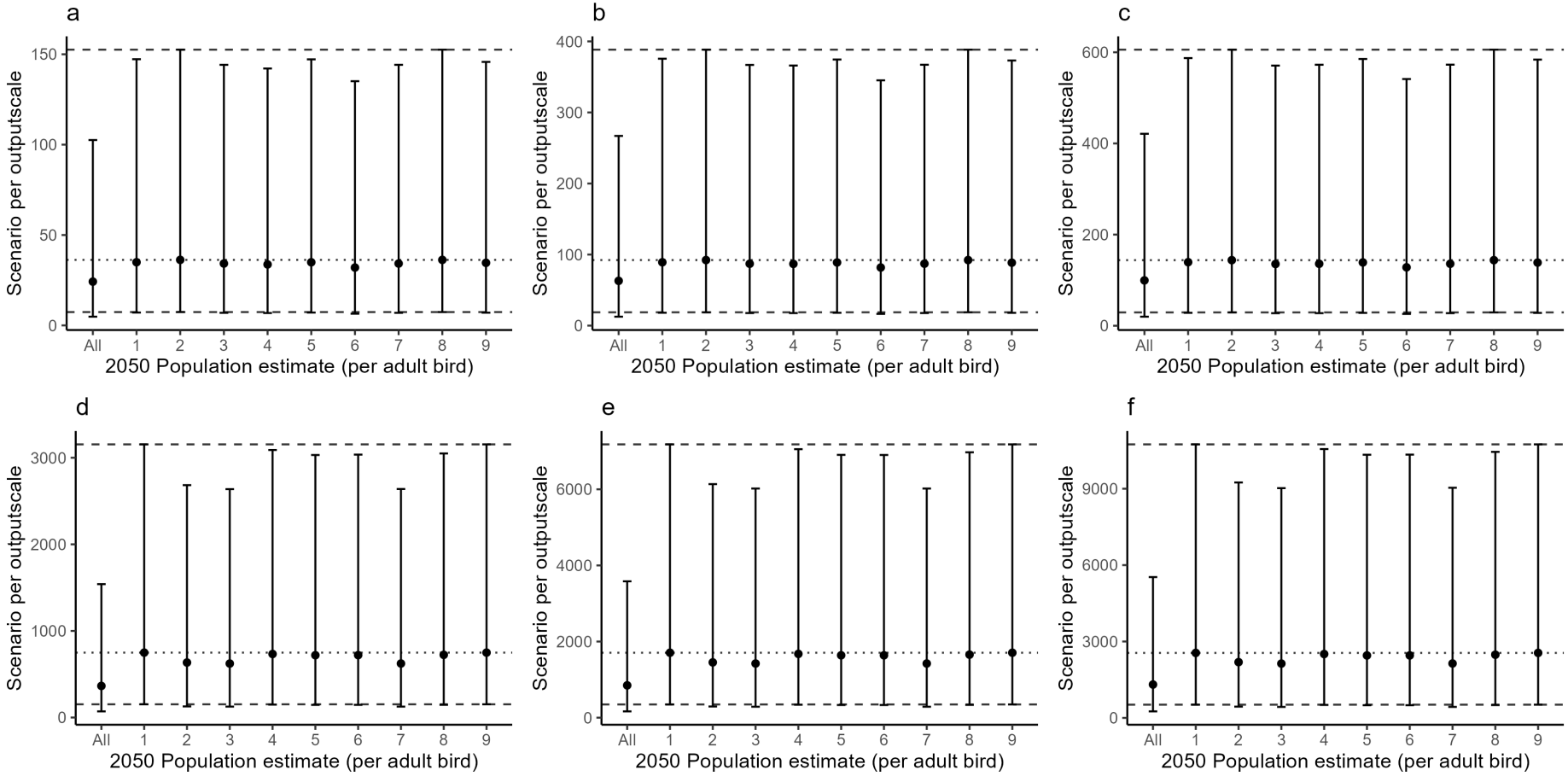


Figure 3: Projected Red Kite populations in the year 2050 under each impact scenario, at each outcome scale. Horizontal lines show projected populations under the unimpacted baseline scenario (dotted: median, dashed: 95% confidence interval). Points show median estimates and lines indicate 95% confidence intervals. Panels show projected population sizes at different outcome scales: a) Berwyn SPA (from Hereward *et al.* 2024); b) Berwyn SPA plus 2-km buffer (from Hereward *et al.* 2024); c) Berwyn SPA plus 4-km buffer; d) Elenydd–Mallaen SPA (from Hereward *et al.* 2024); e) Elenydd–Mallaen SPA plus 2-km buffer (from Hereward *et al.* 2024); f) Elenydd–Mallaen SPA plus 4-km buffer. In each panel, a population size is shown for the 'all developers' impact scenario, as well as for each developer (1–9) in turn along the x-axis.



Discussion

The findings of the present analysis reflect those of the original report (Hereward *et al*. 2024), in that the impacts of even the most extreme scenario of wind energy development on either SPA population are projected to be relatively small. Therefore, this result reinforces the key findings of that report: that the probability of wind energy development preventing the continued growth of the Welsh Red Kite population is very low, but more caution is warranted with respect to developments in close proximity to the Berwyn and Elenydd–Mallaen SPAs. Caveats and assumptions highlighted in the report discussion remain relevant.

A further consideration is the relevance of any potential decline within the SPA populations. The Elenydd–Mallaen SPA Core Management Plan (CMP) sets a target that "at least 15 pairs of [Red Kites] nest regularly within the SPA, or within 2 km of the boundary" (CCW 2008a). For the Berwyn SPA, the equivalent target is two pairs (CCW 2008b). Since the time at which these SPA features were designated, the population and distribution of Red Kite in Wales have increased dramatically, such that current estimates of the populations for these SPAs are considerably higher than these targets (Table 1), especially for the Elenydd–Mallaen SPA where we estimate that over 250 pairs may now be functionally linked to the SPA (i.e. breed within the SPA or the 4-km buffer zone). Therefore, population stabilisation – or even a period of gradual decline – might not be expected to immediately lead to poor status if assessed solely and strictly against criteria set at the time of designation, that have not been updated to reflect recent population growth.

References

CCW. 2008a. *Core management plan (including conservation objectives) incorporating: Elenydd–Mallaen Special Protection Area, Elenydd Special Area for Conservation (SAC), Coetiroedd Cym Elan / Elan Valley Woodlands SAC, Cwm Doethie – Mynydd Mallaen SAC.* CCW. **https://naturalresources.wales/media/671965/Elenydd_cSAC_core_English.pdf**.

CCW. 2008b. *Core management plan (including conservation objectives) for: Berwyn & South Clwyd Mountains SAC & Berwyn SPA.* CCW. **https://naturalresources.wales/media/670888/Berwyn%20man%20plan%20(E)%20(table%20revis%2010.09.09).pdf**.

Hereward, H.F.R., Macgregor, C.J., Gabb, O., Connell, A., Thomas, R.J., Cross, A.V. & Taylor, R.C. 2024. Modelling population-level impacts of wind farm collision risk on Welsh Red Kites. *BTO Research Report* **766**. British Trust for Ornithology, Thetford.

Heywood, J.J.N., Massimino, D., Balmer, D.E., Kelly, L., Noble, D.G., Pearce-Higgins, J.W., Woodcock, P., Wotton, S., Gillings, S. & Harris, S.J. 2023. The Breeding Bird Survey 2022. *BTO Research Report* **756**. British Trust for Ornithology, Thetford.

JNCC. 2015a. Natura 2000 – standard data form (Elenydd–Mallaen SPA). JNCC, Peterborough. **https://jncc.gov.uk/jncc-assets/SPA-N2K/UK9014111.pdf**.

JNCC. 2015b. Natura 2000 – standard data form (Berwyn SPA). JNCC, Peterborough. **https://jncc.gov.uk/jncc-assets/SPA-N2K/UK9013111.pdf**.

Scottish Natural Heritage. 2016. *Assessing Connectivity with Special Protection Areas (SPAs), Guidance.* Nature Scot. **https://www.nature.scot/sites/default/files/2022-12/Assessing%20connectivity%20with%20special%20protection%20areas.pdf**.

Front cover: Philip Croft / BTO; back cover: Sarah Kelman / BTO

Modelling population-level impacts of wind farm collision risk on Welsh Red Kites: populations functionally linked to two Special Protection Areas.

An addendum to Research Report 766.

The Welsh Red Kite population is currently in ongoing recovery after a historic decline driven by persecution, and a consequent population bottleneck during the first half of the 20th Century. Trends from the BTO/JNCC/RSPB Breeding Bird Survey show that the population has grown rapidly over the past few decades. Nonetheless, the Red Kite remains a conservation concern, in particular around two Special Protection Areas (SPAs) designated for the species' conservation: the Berwyn SPA and the Elenydd–Mallaen SPA.

Wind turbines represent a known threat to Red Kite populations, causing additional mortality through collisions. A large number of wind farm sites are currently at various stages of development (ranging from aspirational schemes to proposals under assessment) in Wales, especially in Mid Wales where Red Kites are at their highest density and where the Elenydd–Mallaen SPA is situated

The aim of this analysis was to model the potential impacts of current and proposed wind farm developments on the Welsh population of Red Kites, using a Population Viability Analysis. The present analysis was conducted as an addendum to Hereward *et al.* (2024), in order to additionally model impacts on SPA populations as the number of birds nesting within the SPA or within 4 km of its boundary, better reflecting the current policy landscape.

Suggested citation: Hereward, H.F.R., Macgregor, C.J., Gabb, O., Connell, A., Thomas, R.J., Cross, A.V. & Taylor, R.C. 2025. Modelling population-level impacts of wind farm collision risk on Welsh Red Kites: populations functionally linked to two Special Protection Areas. An addendum to Research Report 766. *BTO Research Report* **799**, BTO, Thetford, UK.

ISBN 978-1-912642-99-1

BSG | ecology

BTO Birds Science People