

## RSPB Bird Survey on Solar Farms: Responses Received from Authors to KSCA Questions

While the authors are unable to comment on specific solar farms or upcoming installations, they were happy to answer our questions regarding their research. They have provided detailed responses to the questions, with each one listed in italics and followed by a bulleted answer.

We thank the authors for their valuable insights on birds and solar farms, which have helped to increase our understanding of the ecological impacts and the importance of habitat management in solar farm sites.

KSCA question/topic	Authors' response	KSCA comment
<p><b><i>Q1: Based on these larger land areas of large-scale solar farms, do you think your results are directly scalable and would differences in density of panels affect the results?</i></b></p>	<ul style="list-style-type: none"> <li>• This is an interesting question and one we've previously thought quite a lot about. It is hard to comment on what the impacts of larger land areas and differences in densities of the panels may be without direct data on this. In our study, the driving factor leading to higher bird abundance and diversity was the way the solar farm was managed, across a range of sizes (though still smaller than those you highlight). So, assuming features such as hedgerows around the boundary and a diverse mix of vegetation are implemented throughout the site, one could assume this will provide habitat and it is likely that more birds will be present in these solar farms, regardless of size, than those managed intensively without such features.</li> <li>• Furthermore, some of the larger sites we visited are split into sub-parcels. Rather than one large solar farm sprawling across fields, the original field shape and sizes have been maintained with the ditches and/or hedgerows running between some of the land parcels,</li> </ul>	<p>Larger solar sites that maintain natural features like ditches and hedgerows between sub-parcels of land could also help preserve habitats and minimize visual impact, suggesting that habitat features, rather than size, are most important.</p>

	<p>not only keeping habitat for wildlife but also minimising the visual impact. So, it may not be the overall size that is important, per se, but rather the features (e.g. hedgerows, ditches, diverse vegetation) present.</p>	
<p><b>Q2: While not part of this research, but also relevant to the size of the development, have you given any consideration to the disturbance of birds during construction?</b></p>	<ul style="list-style-type: none"> <li>• This is unfortunately not something we were able to account for in this research. More widely, there is little research into this. A full BACI study would be needed to assess the impact of construction, and this would take a number of years and would need the cooperation of the solar developers to provide access to the site throughout the construction period.</li> </ul>	<p>This highlights a gap in the research, with potential implications for understanding the effects of construction on bird populations and ensuring that mitigation measures are in place.</p>
<p><b>Q3: We have seen proposals to create skylark plots in adjacent fields during construction, aiming to encourage temporary relocation with the expectation of their return. However, we wonder how far they can be displaced in this way and how other species would be managed in this regard?</b></p>	<ul style="list-style-type: none"> <li>• This is not an area of expertise for us, so we cannot comment on specifics. Though, the links below show the effectiveness of Skylark plots particularly when lack of suitable habitat is present on agricultural land: <ul style="list-style-type: none"> <li>○ <a href="https://www.tandfonline.com/doi/full/10.1080/00063657.2016.1271394">https://www.tandfonline.com/doi/full/10.1080/00063657.2016.1271394</a></li> <li>○ <a href="https://www.rspb.org.uk/helping-nature/what-we-do/influence-government-and-business/farming/advice-for-farmers-helping-bird-species/skylark-advice-for-farmers">https://www.rspb.org.uk/helping-nature/what-we-do/influence-government-and-business/farming/advice-for-farmers-helping-bird-species/skylark-advice-for-farmers</a></li> </ul> </li> </ul>	<p>The research suggests that displacement could have varying impacts on species' specific habitat needs. Further research is needed.</p>
<p><b>Q4: Another potential difference between your research sites and newer ones is panel design. Kingsway have indicated that their panels will be 2.9–3.5m high. The panels at Burnt House Sidings (your site</b></p>	<ul style="list-style-type: none"> <li>• Unfortunately, this is not something we measured, though this data may have been useful. We cannot say how changing panel design and size will impact biodiversity without collecting data on this, but we don't believe the impacts would be large, or at least not large enough to outweigh the greater impact of presence (or not) of woody features, and more diverse habitat. The</li> </ul>	<p>Based on the above, habitat management likely has a greater influence on biodiversity than panel design.</p>

<p><b><i>near Whittlesey) look considerably smaller. Can you say what the panel design was for all your research sites, and whether you would expect differences in design height (shading) and tilt angle to affect the results?</i></b></p>	<p>distance between panels would potentially cause a greater impact, but we presume this will always be large enough to get a cleaning/maintenance machine between panels and, therefore, there will always be a strip of vegetation which can be managed with nature in mind.</p>	
<p><b><i>Q5: With regard to methodology, we can see that farmland adjacent to the solar farm was chosen as it was convenient to survey, and it could be argued that this is likely to be similar to the original condition of the solar farm sites. Were any baseline controls used to determine whether the bird activity data collected were representative of other farmland in the area that was farther from the solar farm and unaffected by its presence?</i></b></p>	<ul style="list-style-type: none"> <li>• After our surveys we compared the species composition, richness, and abundance of birds on farmland against the wider long term Breeding Bird Survey (BBS) dataset for the region. Our surveys on farmland were comparable to this wider dataset.</li> <li>• We have a larger dataset of bird observations on arable land than included in this research, collected as part of the same project (so using the same methods and timings) and these results are in line with the BBS data. There were no major distinguishable differences in those fields surrounding solar farms versus those not in the vicinity of a solar farm.</li> </ul>	<p>The findings showed no significant differences between fields near solar farms and those farther away, suggesting that the data is representative of the wider agricultural landscape around those solar farms, but some caution is needed in applying the results to less intensively farmed landscapes.</p>
<p><b><i>Q6: Could you also please provide more details on the differences between mixed-habitat solar versus simple-habitat solar?</i></b></p>	<ul style="list-style-type: none"> <li>• <i>Mixed habitat solar:</i> Managed with biodiversity in mind. The site is not grazed and is cut infrequently (if at all), allowing a diverse mix of vegetation and greater sward height, with features such as meadow strips (natural or planted) and tussocks under and around the panels and in open areas. Along the boundary fence there are woody features (hedgerows and trees).</li> </ul>	<p>The main difference is that mixed-habitat solar is better for supporting wildlife due to its variety of plants and features such as hedgerows and ditches.</p>

	<ul style="list-style-type: none"> <li>• <i>Simple habitat solar</i>: Intensively managed. Grazed and cut throughout the year leading to a monoculture of grass on the site, at a very short length. No other habitats present and no woody features around the boundary fence.</li> </ul>	
<p><b>Q7: Have comparisons been made with agricultural land using biodynamic farming, regenerative practices, or agroforestry?</b></p>	<ul style="list-style-type: none"> <li>• We have not currently done this. The data was collected as part of our research for the wider Centre for Landscape Regeneration project. Here we aim to identify solutions to the biodiversity and climate crisis through land use scenario modelling. As part of this we collected breeding bird data across a range of land uses, including those which are relatively novel, such as agroforestry and solar farms. We are also working with colleagues looking at intensive arable vs regenerative arable for a range of taxa. However, regenerative farming is a broad term with no clearly defined criteria to define whether a farm is regenerative or not, so it becomes more a sliding scale of regenerative practices.</li> <li>• Undoubtedly, we would have surveyed some range of intensities of farming. However, the Fens, where our surveys were carried out, is a largely intensive arable and horticultural dominated region, so our surveys in surrounding farmland would likely have been representative of the area.</li> <li>• Slightly outside our survey area, at RSPB Hope Farm, which employs Nature Friendly Farming practices, a number of the species observed here were also observed in the mixed habitat solar farms (Corn Bunting, Yellowhammer, Linnet).</li> </ul>	<p>Surveys in the Fens showed mixed-habitat solar farms support species found at RSPB Hope Farm, suggesting potential for similar biodiversity. However, further research is needed, especially on skylarks and lapwings, which didn't show an increase</p>

<p><b>Q8: We note that your surveys cover a relatively short period (April to late June). How did you account for migratory birds such as lapwings, fieldfares, redwings, and dotterels, outside this timeframe? We are concerned that your research doesn't account for effects on migratory species that overwinter in agricultural landscapes, where fallow fields or diverse crop rotations provide important food sources.</b></p>	<ul style="list-style-type: none"> <li>For our surveys we used the joint BTO/JNCC/RSPB Breeding Bird Survey (BBS; <a href="https://www.bto.org/our-science/projects/breeding-bird-survey">https://www.bto.org/our-science/projects/breeding-bird-survey</a>). We followed the standard methodology though report results for distance bands 1 and 2, and at the 200m section level rather than the 1km level. We used this methodology because the data we collected needed to be comparable to the wider national BBS dataset, therefore, we were limited in the number of visits and timings. You are correct that we would not have observed overwintering or migrating species and this is undoubtedly an important group where further research is needed.</li> </ul>	<p>The surveys focused on breeding birds from April to June. This timeframe does not account for migratory species or overwintering birds, which we know make use of the proposed Kingsway land parcels.</p>
<p><b>Q9: However, we are surprised to see no data for barn owls, which are relatively common on farmland.</b></p>	<ul style="list-style-type: none"> <li>While our surveys only recorded Barn Owls in the simple habitat solar, they have a wide-ranging foraging area and will certainly be using the surrounding farmland. Unfortunately, this is just a quirk of the survey methods where not all birds within a given area will be recorded if not able to be identified by sight or sound. Furthermore, whilst we did not observe Barn Owls in the other habitats, there were signs of Barn Owl in two of the mixed habitat solar farms and the engineers reported seeing them on a regular basis.</li> </ul>	<p>Barn Owls were recorded in simple habitat solar farms, with signs and regular sightings in mixed habitat solar farms.</p>
<p><b>Q10: Neither lapwings nor skylarks appear to benefit from solar farm development, irrespective of habitats; indeed both seem to suffer</b></p>	<ul style="list-style-type: none"> <li>Yes, both Lapwing and Skylark require large uninterrupted sightlines which solar farms are unable to offer. Our timings would not have been an issue as the BBS survey specifically has two periods to account for late arrivals. Figure 2 in</li> </ul>	<p>Lapwings and skylarks need large, uninterrupted sightlines, which solar farms cannot provide. While both species were</p>

<p><i>(although the numbers for lapwings may be due to the timing of surveys in relation to their migration).</i></p>	<p>our paper shows we did see both species, but predominantly on arable land.</p>	<p>observed, they were mostly found on arable land, not solar farms. The survey timings were not an issue, as the BBS accounts for late arrivals.</p>
<p><b>Q11: The conclusions may not be quite so positive when you realise that the higher species abundance for farmland birds is partly due to an increase in rook, wood pigeon and goldfinch, at the expense of lapwing and skylark. In addition, while skylarks have been noted foraging and singing from solar panels, we are not aware of any conclusive evidence of them nesting within active solar farms in the UK. Are you able to provide any further insights?</b></p>	<ul style="list-style-type: none"> <li>● Farmland birds had a higher abundance in mixed habitat solar. I understand your point regarding Figure 2, but when scrutinising the detail in Figure 1, you'll notice that, for the majority of farmland birds (dotted line border around plots), that mixed habitat solar is highest (middle grey bar). This is not the case for only Rook, Wood Pigeon and Goldfinch, but also Yellowhammer, Stock Dove, Reed Bunting, Linnet, Greenfinch, and Corn Bunting. Also, in Figure 2B, abundance in mixed habitat solar (&gt;20) was more than twice as high as that in arable (&lt;10). This is not solely attributed to Wood Pigeon and Goldfinch, but also the species above. Rook were only present on simple habitat solar.</li> <li>● Lapwing and Skylark did seem to prefer arable, which comes as no surprise, due to their preference for long uninterrupted sightlines, which solar farms are unable to offer.</li> </ul>	<p>Mixed-habitat solar farms saw higher bird abundance, including species like yellowhammer and linnet. However, lapwings and skylarks preferred arable land due to the need for uninterrupted sightlines, which solar farms lack.</p>
<p><b>Q12: Would you consider a further study examining a variety of landscapes which could provide greater clarity and validation for the current findings?</b></p>	<ul style="list-style-type: none"> <li>● This study was only a short research article. We would very much like to carry out further research, focusing on a wider range of solar farms, throughout the UK rather than just East Anglia, and focus on a greater number of taxa, such as mammals, invertebrates, and plants. However, currently, this is not an option for the</li> </ul>	<p>The findings by Golawski et al. 2025 are specific to small, isolated photovoltaic (PV) systems typical in Poland and Central Europe. There is a need for further research on the</p>

	<p>researchers involved due to commitments to other work projects. Though should the data/time/funding become available, it is something we could consider.</p> <ul style="list-style-type: none"> <li>● In terms of validation, our study does reflect the wider literature (the little there is), such as: <a href="#">Golawski et al., 2025</a>. Increased bird diversity around small-scale solar energy plants in agricultural landscape</li> </ul>	<p>impact of larger PV installations on bird populations.</p>
<p><b>Q13: Do you have any views on what key actions we can take to monitor and help mitigate potential negative effects, perhaps as part of a citizen science project? This effort, of course, should extend beyond birds to include mammals like the brown hare, as well as insects and plant life.</b></p>	<ul style="list-style-type: none"> <li>● In terms of monitoring, we would suggest carrying out systematic surveys for the taxa you're interested in, though this may be difficult due to access rights. For birds we'd suggest either BBS methodology, or perhaps a static point count due to access issues. This would allow you to carry out surveys throughout the year, picking up overwintering or migratory species which you have mentioned, from public footpaths/rights of way. <ul style="list-style-type: none"> <li>○ <a href="https://www.bto.org/our-science/projects/breeding-bird-survey">https://www.bto.org/our-science/projects/breeding-bird-survey</a>;</li> <li>○ <a href="https://research.fs.usda.gov/tree-search/31461">https://research.fs.usda.gov/tree-search/31461</a></li> </ul> </li> <li>● For mammals, it could be done with a similar static point count, noting the number of individuals and species. Consistency in methods is key in enabling you to compare trends across years/monitoring periods. This would mean ensuring the same time per count (typically 10 minutes for point counting birds) and the same number of counts per site and year. Collecting such rich consistent data may reveal trends.</li> </ul>	<p>To monitor and mitigate solar farm impacts, consistent surveys for birds, mammals, insects, and plants using methods like BBS or static point counts are essential. Citizen science can support these efforts by involving local communities in data collection.</p>
<p><b>Q14: We agree with your advice that solar farms should be kept away from nature-sensitive</b></p>	<ul style="list-style-type: none"> <li>● By nature-sensitive areas we mean sites which have designations, such as SSSIs, SPAs, and SACs, but also those which are undesignated and</li> </ul>	<p>The paper on <a href="#">Reconciling Biodiversity</a> suggests that current technologies for</p>

<p><b>areas, but we would like to understand your definition of these areas.</b></p>	<p>have been deemed ecologically sensitive.</p> <ul style="list-style-type: none"> <li>● A previous piece of RSPB work produced sensitivity maps for a range of species (based on the distribution of protected areas and the foraging and home ranges of sensitive species) for renewable energy (solar, wind, and bioenergy crops, onshore). The paper and data can be accessed below: <ul style="list-style-type: none"> <li>○ <a href="https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0150956">https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0150956</a>;</li> <li>○ <a href="https://opendata-rspb.opendata.arcgis.com/datasets/RSPB::solar-energy-opportunity-showing-sensitivity-and-constraints/about">https://opendata-rspb.opendata.arcgis.com/datasets/RSPB::solar-energy-opportunity-showing-sensitivity-and-constraints/about</a></li> </ul> </li> </ul>	<p>renewable energy can have minimal ecological impact, provided they are carefully monitored and sited to enhance biodiversity. Sensitivity maps, such as those from RSPB, identify areas that should be avoided for renewable energy development, including solar farms, based on the distribution of sensitive species and protected areas. According to the RSPB sensitivity map, Kingsway Solar is located in a medium-sensitivity area.</p>
<p><b>Q15: Similarly, we would appreciate clarification on your definition of high-grade agricultural land.</b></p>	<ul style="list-style-type: none"> <li>● By high-grade farmland we mean the best and most versatile land, i.e. Agricultural Land Classification Grades 1 to 3a.</li> </ul>	
<p><b>Q16: Can you also further elucidate on the ‘potential leakage effects’ and how this relates to the paper by Don et al, 2024, which does not discuss solar farms as part of climate mitigation?</b></p>	<ul style="list-style-type: none"> <li>● ‘Leakage effects’ in our context refer to the potential relocation of food production if agricultural land is taken out of production. For example, if high-grade agricultural land was turned into solar farms, the reduction in food produced would mean that the food needs to be produced elsewhere instead. This leakage can operate at different scales, e.g. local (displacing it to elsewhere in the surrounding area), national (elsewhere in the UK) or global (elsewhere in the world). Don</li> </ul>	<p>‘Leakage effects’ refer to food production being displaced when agricultural land is used for solar farms. Although ground-mounted solar farms currently occupy just 0.1% of UK land—projected to rise to only 0.3% if 2050 solar targets are met (compared to</p>

	<p>et al. aren't specially looking at solar farms, but they are discussing the context of leakage. There is also a relevant recent paper by Balmford et al. which talks more about leakage.</p> <ul style="list-style-type: none"> <li>○ <a href="https://www.science.org/doi/10.1126/science.adv8264">https://www.science.org/doi/10.1126/science.adv8264</a></li> <li>● As mentioned in the paper, previous modelling at the national scale suggests that the total land required for solar farms under future climate mitigation scenarios is small (link to this paper below). So, the total amount of potential 'leakage' of food production due to solar installations is also likely to be small, especially if care is given to site them away from the highest-grade agricultural land <ul style="list-style-type: none"> <li>○ <a href="https://www.cell.com/cell-reports-sustainability/fulltext/S2949-7906(24)00195-2">https://www.cell.com/cell-reports-sustainability/fulltext/S2949-7906(24)00195-2</a></li> </ul> </li> </ul>	<p>0.6% for golf courses)—an analysis by <a href="#">Solar Q</a> indicates that concentrations in certain regions exceed 1%. This makes it especially important to avoid high-quality agricultural land in affected areas.</p>
<p><b>Q17: Looking ahead, with two large-scale solar farms near Cambridge (one approved) and over 15 more at various stages of application and approval across Lincolnshire, Norfolk, Cambridgeshire, and Suffolk, would you be interested in further research to determine whether these results remain consistent on a much larger scale? Given the potential for greater impacts on local ecosystems and nature corridors, we would love to meet and explore opportunities for collaboration.</b></p>	<ul style="list-style-type: none"> <li>● As above, we would very much like to carry out further research, focusing on a wider range of solar farms, throughout the UK as well as East Anglia, and focus on a greater number of taxa, such as mammals, invertebrates, and plants.</li> <li>● Currently, this is not an option for the researchers involved due to commitments to other work projects. Though, should the data/time/funding become available, it is something we could consider.</li> <li>● We would be very happy to collaborate on such work, and one potential way which would allow us to do so is to work with others collecting and providing us with the data to analyse.</li> </ul>	<p>The researchers are interested in expanding their study to more solar farms and taxa, but current commitments prevent this. They are open to collaboration and suggest partnering with others to collect data for analysis.</p>

