

Arventus Skylark Metric – Technical Note

The text below sets out the technical background to the Arventus Skylark Metric.

Skylarks

Skylarks are birds of open, unwooded countryside found across moorland, grassland and cropland habitats. Nesting density varies depending on habitat and crop type, although is typically between 0.05 and 0.1 territories per ha within grassland and arable habitats, increasing to 0.3 territories per ha within set-aside land (*Donald, P.F. and Vickery, J.A., 2000*).

The UK population declined sharply during the late 20th century, dropping by 75% between 1972 and 1996, with concurrent declines seen across north-western Europe. The primary driver of this decline is believed to have been the widespread switch from spring to autumn sown cereal crops. Autumn-sown crops have grown too tall by the breeding season (March to August) for skylarks to be able to successfully raise the three broods necessary to sustain their populations.

Population decline is also potentially linked to the substantial decrease in invertebrate numbers, shown by the *2023 State of Nature Report* among other publications. Research by *Mancini et al. (2023)* indicates invertebrate decline is greatest in regions with high cropland cover. As skylark chicks feed almost exclusively on invertebrates during the spring and summer, a reduction in invertebrate numbers will significantly impact their breeding success. In the winter, adult skylarks rely on the leaves and seeds of crops and grasses/herbs.

Skylark is included on the Red List under Birds of Conservation Concern and is a Priority Species within England under the Natural Environment and Rural Communities Act 2006.

Skylarks and Solar Farms

Skylarks require open areas with unbroken sight lines for nesting, with confirmed breeding of skylarks within solar sites restricted to unpanelled areas. As a result, the placement of a solar panel array in an area previously managed as cereal crop is thought to render a development area unsuitable for nesting. It is therefore assumed that any skylark territories within the development area are likely to be either lost or displaced into surrounding areas.

There is only a limited amount of research available on how skylarks and other farmland birds use solar farms, however, a study undertaken by R. Shotton between 2018 and 2020 in partnership with the RSPB Centre for Conservation Science and energy solutions company Anesco (<https://community.rspb.org.uk/ourwork/b/science/posts/bird-use->

[on-solar-farms-final-results](#)) found that “Solar farms are being used by birds at a similar level compared to other land use types. There was also a significantly higher variation of species found on solar farms compared to arable fields which suggest that solar farms provide a habitat for a range of farmland birds”. A survey of 59 solar sites in 2023 recorded skylark being present at 71% of the solar farms (Solar Habitat 2024: Ecological trends on solar farms in the UK). Whilst no clear patterns between bird biodiversity and site management was directly found, there were positive relationships between bird species richness and plant species richness, as well as a positive relationship between bird abundance and invertebrate abundance across solar farms.

Research has shown that skylarks incorporate solar farms into their territories, with these areas widely utilised as a foraging resource for the species. Research by Montag *et al.* (2016) compared solar plots with unpanelled control plots at eleven sites across the UK. Although no nesting was recorded within panel arrays, the number of territories recorded in these areas was not significantly lower, nor were the number of foraging birds observed. Indeed, at two of the plots, numbers of foraging skylark were significantly higher in the solar plot than the control. This suggests that skylark nest sites ‘lost’ by creating a solar development are displaced into the surrounding habitat, with the solar site continuing to form part of the territory of displaced birds.

An article by Harry Fox in CIEEM InPracytice (Issue 117, September 2022) states that although nesting has not been confirmed on solar sites, “skylarks have been recorded many times foraging within solar arrays and even feeding recently fledged young. Fledglings can disperse considerable distances from their nests in just a few days and continue to be fed by parent birds for between 8 and 12 days after fledging (Donald, 2004), so this behavior alone may not be considered evidence of nesting on site. It is possible, therefore, that development sites with suitable grassland might even provide ‘nursery’ habitat where nesting takes place on adjacent farmland.”

A bird survey conducted in 2023 focused on nest searching on a site where skylarks were observed (Solar Habitat 2024: Ecological trends on solar farms in the UK). No nests were found, however, a bird was observed regularly collecting food from within the solar farm then flying to an adjacent arable field, indicating that the solar farm offered a preferred resource for foraging by skylarks.

Aims and Purpose of the Skylark Metric

The Skylark Metric initially aims to quantify the potential number of skylark territories displaced by the solar development. It then aims to quantify the increased carrying capacity (through increased breeding density and breeding success/productivity) of birds in adjacent fields once the land within solar farms moves from arable to high quality

grassland - the Metric terms this the ‘foraging uplift’. The Metric also allows for ‘off-site’ mitigation land to be brought into the calculation, as needed. Overall, the Metric demonstrates the number of skylark territories lost or gained.

Skylark Baseline

The Metric allows users to select the baseline habitats of their site on a field-by-field basis. Territory densities are then calculated based on the values in *Table 3.2 of The Skylark (Paul F. Donald, 2004)* for the various habitat types. The Metric can account for crop rotation data for up to five years; crop rotation means that usage of a site by skylarks will vary annually depending on what crop is sewn.

The Metric can also use densities as calculated from survey data. In addition to the values in the table below, the Metric also allows for a ‘rotational crop’ option. This should be used where the actual cropping schedule is not available, but it is known that the crop sewn does change year to year. The ‘rotational crop’ territory density is calculated as an average of the arable crop densities in Table 1 below. ‘Rotational Crop’ can be applied to England, Wales and Scotland but has been calculated based on the England/Wales values to ensure it does not undervalue cereal crop dominant rotations in Scotland. The ‘Rotational Crop’ density is calculated as $(0.108 \text{ (cereals)} + 0.119 \text{ (root crops)} + 0.095 \text{ (brassicas)} + 0.129 \text{ (legumes)}) / 4 = 0.11275$.

The skylark densities used in the metric are shown in Figure 1, below:

Table 1. Territory densities (territories per ha) of Skylarks in different crop types, the percentage of farmland made up by each crop type and the percentage of total Skylark population found in each crop type. Data for Scotland are presented separately owing to differences in the way agricultural statistics are collected. Crop data from MAFF (1998) and Scottish Office (1998), Skylark data from BTO National Breeding Skylark Survey (Browne <i>et al.</i> 2000).			
Crop	Density	% area	% of population
England & Wales			
Cereals	0.108	30	40
Improved grass	0.054	47	31
Set-aside	0.296	3	10
Rough grazing	0.059	10	7
Root crops	0.119	3	5
Brassicas	0.095	4	4
Legumes	0.129	2	3
Scotland			
Grazed pasture	0.084	45	39
Cereals	0.115	28	34
Mown grass	0.076	19	15
Set-aside	0.360	2	9
Brassicas	0.051	4	2
Root crops	0.054	2	1

Figure 1 – Skylark nesting densities according to habitat type (Donald, 2004)

The Metric allows for the exclusion of baseline fields that are under 5ha in size as these are considered sub-optimal for nesting skylark. If accounted for in the baseline this must also apply when determining ‘foraging uplift’ later on - all adjacent fields under 5ha must then be excluded from this calculation.

Edge Effect

The Metric has been designed to take into account skylark predator avoidance behavior. Skylarks have been shown to have a strong avoidance for nesting in close proximity to boundary features, such as hedgerows and tall structures such as mature trees and pylons. 50m is suggested as a conservative distance within the model, studies have shown the avoidance of tall structures, i.e. trees, could be up to 200m (Oelke, 1968).

Foraging Uplift

The Metric aims to quantify the increase in breeding density / breeding success of birds within fields adjacent to solar farms as a result of the creation of high quality foraging habitat, akin to ‘set aside’ which is secure in the long term (30-40 years management agreements through planning and BNG obligations).

The decline of the skylark population has been attributed to changes in agricultural practice (Fuller et al. 1995; Chamberlain & Crick 1999). An increasing amount of evidence suggests that a crucial factor underlying the population decline is a reduction in the number of breeding attempts made per year that has arisen due to changes in sowing regimes, changes in the growth rate and sward density of crops and, in particular, the replacement of spring cereals with winter cereals (Wilson et al. 1997).

A large-scale study of skylark territory densities in different habitats, including different crops (D.E. Chamberlain, A.M. Wilson, S.J. Browne, J.A. Vickery, 2001) found that in lowland arable landscapes, vegetation height had significant effects on the probability of the occupancy of skylarks in a crop. The greatest rates of occupancy occurred where vegetation was present at heights of under 30cm and that differences in the probability of occupancy between crops are largely associated with vegetation height. Figure 2, below, shows the mean date (where date 1 = 1st March) on which a height category of over 30cm was recorded for eight different crop types.

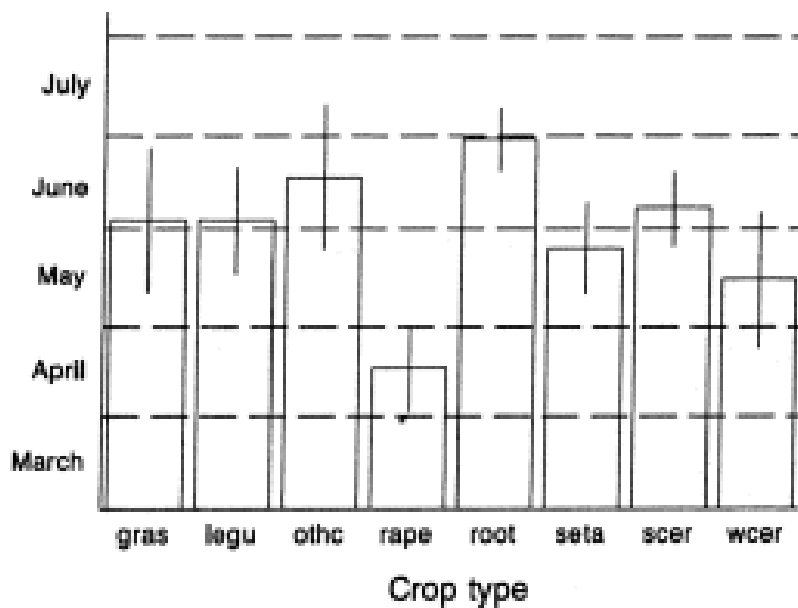


Figure 2 – Mean date at which different crops exceed 30cm (D.E. Chamberlain, A.M. Wilson, S.J. Browne, J.A. Vickery, 2001)

As can be seen from the figure above there is no significant difference between the mean dates set-aside, grasses and legumes reach 30cm, with set-aside reaching it slightly earlier. Given that set-aside is known to support higher territory densities than grassland or legumes, despite growing at a similar rate, the data indicates that the difference in nesting density is due to the abundance of food resource associated with set-aside. The study found that in arable landscapes, set-aside showed consistent significant positive effects on skylark density. This data can be used to determine a ratio ‘uplift’ in territory density for adjacent nesting habitats. By using a ratio, the baseline habitat present is taken into account, i.e. the uplift is lower where adjacent habitats would already support lower numbers of skylark.

If the average distance a skylark will travel to forage is taken as c.200m (Poulsen, J.G.,1996) then it can be concluded that the foraging resource will benefit skylarks located within 200m of the site.

In order to determine the numerical value of this uplift, the available foraging uplift within the solar site must be determined, followed by the availability of adjacent habitat (see Arventus Skylark Metric Worked Example for a demonstration of how the total area of adjacent land that could benefit from ‘foraging uplift’ is measured as well as how the area of ‘available foraging’ is measured). This is a necessary step as 1ha of foraging can only ever provide an uplift of a fixed number of skylark territories (actual number will be dependent upon baseline habitat present), regardless of the amount of adjacent habitat available. Conversely, if there is only 1ha of adjacent habitat available then this would

become the limiting factor with regards to the uplift in skylark territories that can be delivered, regardless of the abundance of new available foraging resource on the solar site. The Metric includes a mechanism whereby these two numbers are calculated, and then the lower number is taken as the ‘uplift’.

Off-site Mitigation

The Metric allows for two options for off-site mitigation. Option A is for off-site fields that are over 5ha. In this instance the baseline is calculated as per the Baseline Section above and then compared to the nesting density that would be predicted if the field was set aside (i.e. 0.296 territories per ha in England). The difference in these two numbers is then calculated and this is the number of territories delivered.

Option B is for fields under 5ha where actual nesting is considered unlikely to increase significantly if the field is converted to set aside due to small size. In this case the ‘foraging uplift’ to adjacent habitat surrounding the Mitigation B field is calculated in the same way as it is for the main site, as per Foraging Uplift Section above.

It is important to note that the Metric identifies the ‘need’ for additional mitigation based on ‘no net loss’ of territories. This may not always be appropriate and the acceptable loss of territories should be agreed with the relevant consultee. The Metric does however provide the data to inform these discussions.

Overall Territory Loss or Gain

The overall loss and gain in skylark territories is calculated by summing territories delivered through foraging uplift from the development site and territories delivered by Mitigation Options A and B. This is then compared to the baseline territories displaced to allow a number of territories lost or gained to be calculated. This is also calculated as a percentage.

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