




**Solar
Energy
UK**



SOLAR ENERGY UK GUIDANCE
A Standardised Approach
to Monitoring Biodiversity
on Solar Farms

In collaboration with:

**CLARKSON
& WOODS** 
ECOLOGICAL CONSULTANTS

 **Wychwood**
BIODIVERSITY

Lancaster 
University

Summary

Ecological monitoring of solar farms plays an important role in assessing change, identifying management issues, and ensuring planning obligations are met. It also provides us with valuable data to explore the impacts that solar farm developments are having on our environment; this will become increasingly important as more and larger solar arrays are constructed to meet our energy requirements and climate change commitments.

The approach to ecological monitoring varies greatly and this makes it difficult to pool data in order to look at the national picture. Therefore, a collaboration was formed between Solar Energy UK, Clarkson & Woods, Wychwood Biodiversity and Lancaster University to devise a standardised approach. This will ensure that asset owners are obtaining the same standard of information and also allows for amalgamation of information, where asset owners are willing to do this. Solar Energy UK will be using this information annually to publish a UK wide report with detailed analyses of ecological trends on solar farms across the UK. It will provide the industry with important information on the biodiversity impacts of solar farms, as well as a knowledge base to inform management practice.

The monitoring approach is detailed in the table overleaf. It has been split into “Key Components” which should be measured on every monitoring visit, as well as “Additional Components” which may be selected due to planning requirements or where asset owners are interested in furthering their understanding of particular aspects of their sites. These will be site specific, and some may be more applicable to certain sites than others; the ecologist will be able to make suitable suggestions for further survey work.

We have included timing considerations in terms of seasonality but also the estimated time required to undertake a survey – this will help determine whether surveys can be undertaken in a single day or if several days (or repeat visits) are required.

A standardised survey sheet has also been prepared in Excel format which can be used to collect data in the field. We would also recommend mapping is undertaken either electronically, or using a paper map, as this is helpful to locate habitats, quadrats, fixed point photographs, habitat boxes and any specific issues that require attention (such as the location of invasive plants or concentrations of injurious weeds).

Where asset owners are willing for anonymised data to be submitted to Solar Energy UK in order to analyse for the annual report, the Excel sheet should be sent to the following email address: **monitoring@solarenergyuk.org**

Key Components – to be measured on every site

Component	Description	Time Required on Site Frequency of Survey	Further Considerations
Site Information	<p>To be completed by the asset owner or O&M company. This will include information on current and past management, seeding or planting that has been undertaken as well as future plans in terms of changes in management.</p> <p>Other information will include location, size, date of grid connection, PV technology, height of panels (ground to leading edge) and distance between panels.</p>	<p>Time required: can take time to obtain this information To be recorded during every visit.</p>	<p>This information should be collected at an early stage in the project as it can take some time to collect the data from relevant bodies.</p>
Standard Survey Data	<ul style="list-style-type: none"> ·Name of surveyor ·Date ·Weather (temp, wind – Beaufort scale, rain, cloud – Okta scale) ·Time at start/end of survey (i.e. time spent on site) 	<p>Time required: minimal To be recorded during every visit.</p>	
Site Management	<p>Site management categories have been devised to produce a standard summary which is comparable between sites:</p> <ol style="list-style-type: none"> 1. Optimal management for wildlife with conservation cutting/grazing¹ applied and no herbicide use. Arisings are removed from the site. Diversity of habitats (e.g. meadows, tussocky grassland, woodland planting, hedgerow planting). 2. Conservation cutting/grazing applied. Arisings left on the site with signs of a thatch of vegetation in places. Diversity of habitats (e.g. meadows, tussocky grassland, woodland planting, hedgerow planting). Herbicides may be used, but spot treatment only. 3. Site cut or grazed throughout the season leading to short sward in the summer months. However, some other habitats present such as tussocky margins or planted hedgerows/woodland. Use of herbicides apparent (i.e. blanket spraying beneath panels). 4. Site cut or grazed throughout the season leading to short sward in the summer months. No other habitats (tussocky margins, new hedgerows/woodland). Use of herbicides apparent (i.e. blanket spraying of fields or beneath panels). 5. Site unmanaged or "other". 	<p>Time required: minimal To be recorded during every visit.</p>	<p>This data may be obtained at an early stage from the O&M company or asset owner. However, where this information cannot be obtained, management may need to be ascertained from the survey (i.e. evidence of grazing, height of vegetation, evidence of spraying, etc).</p>

<p>UK Hab Survey</p>	<p>Mapping of all habitats within the redline boundary using the UK Hab categories.³ These can then be used to calculate Biodiversity Net Gain if required.</p>	<p>Time required: dependent on size of site Should be repeated every 5 years</p>	<p>Where beneath panel habitat is distinct and requires separate mapping, a calculation of area may be made from the number of panels on the site (a figure usually included within the Site Layout Plan). Best carried out April to October inclusive</p>
<p>Standard Botanical Quadrats</p>	<p>2x2m quadrats at fixed locations:</p> <ul style="list-style-type: none"> • 5 quadrats recorded directly beneath panels • 5 quadrats recorded in the open, between the strings of panels • 5 quadrats recorded in "enhanced" area – selected as the most diverse habitat within the redline/lease boundary. Habitat category recorded: field margin (within security fencing); field margin (outside security fencing); easement area; ground nesting bird area; other (please specify). • 5 quadrats recorded within a control site – a field within the same landowners holding, which is managed in the same way the land within the array was prior to construction <p>The % cover of all species within the quadrat will be recorded. Other information to record include: height of sward in cm and % cover of bare ground, dead thatch and standing water (where applicable).</p>	<p>Time required: approx. 3–5 hrs To be recorded during every visit.</p>	<p>Where a site is very large, or distinct habitats are present, more quadrats may be required. There may not be enhanced areas on every site and it may not be possible to access control areas given land ownership. Moreover, 20 quadrats may not be possible in one day and thus undertaking both "enhanced" and "control" may not be feasible. Fixed locations can be marked through flagging legs of panel frames or security fencing (with flagging/cable ties etc). Strings may also be numbered which can aid with locating quadrat positions. Best carried out April to August inclusive</p>
<p>Nectar Production Potential</p>	<p>Use the botanical quadrats to infer nectar production potential using established data.⁴</p>	<p>Minimal time required Should be repeated with every botanical survey</p>	
<p>Basic Soil Survey</p>	<p>Basic agricultural soil properties (pH, soil type, soil organic matter [SOM], soil moisture, nitrogen phosphorus, potassium and magnesium). The methodology for soil collection should be checked with the laboratory, but will likely follow the standard collection method for agricultural analysis.⁵ We would suggest taking samples from one field within the array within a 4ha area (further fields can be included as separate samples) in addition, samples can be taken from a field outside the array which is managed in the same way that the array was prior to construction, as a control.</p>	<p>Time required: 1hr to collect samples Should be repeated every 5 years</p>	<p>Soil can be collected on site and sent to a laboratory at minimal cost or equipment purchased to enable in house analyses. A basic measure of soil carbon can also be obtained from the organic matter measurement (organic matter divided by 1.72). Soil analyses can also help to inform seeding of a site and indicate why seeding may have failed. Can be carried out at any time of the year</p>

<p>Fixed Point Photographs</p>	<p>A number of fixed-point photographs can be a simple way to visually assess change.</p>	<p>Minimal time required To be recorded during every visit</p>	<p>The number taken will depend on the variability of habitats, but we suggest 5-10. The simplest way to approach this is to take a photo from the quadrat location and record the orientation.</p>
<p>Ad-hoc Sightings</p>	<p>Observations of species are recorded during the time spent on site; this may include sightings of hares and other mammals, birds by song or sight, patches of wildflowers, badger latrines, owl pellets as well as invertebrates (a tally should be kept for butterflies and bumblebees).</p>	<p>Minimal time required To be recorded during every visit</p>	<p>Although not directly comparable, ad hoc sightings can give a qualitative picture of a site. Best carried out April to August inclusive</p>



1. Conservation grazing is defined as a regime where livestock are removed for at least 8 weeks between April and July or where livestock units are low enough to leave a varied and tall sward with flowering plants present (usually in the region of 2.5 sheep/ha/yr). Conservation cutting relates to a hay cut (where cutting takes place in July or later), with no cutting between April and July.
2. Where management is unknown, it is often possible to look at evidence to indicate the likely category. This may include the height of grassland, diversity of broadleaved plants, presence of dead material (grass clippings or areas of dead weeds), presence of sheep dung etc.
3. <https://ukhab.org/>
4. <https://catalogue.ceh.ac.uk/documents/69402002-1676-4de9-a04e-d17e827db93c>
5. https://www.farmingforabetterclimate.org/wp-content/uploads/2018/02/How_to_take_a_soil_sample.pdf

Additional Components – will be site/budget dependant

Component	Description	Time Required on Site	Further Considerations
Wild Power Scorecard	Completion of this scorecard ⁶ is a useful way to categorise sites according to their focus on biodiversity and also track overall change on a site or identify areas where positive changes can be made to management or habitat provision.	Time required: approx. 3-4 hrs Should be updated every 3-5 years (or when management changes are made)	Can be carried out at any time of the year
SPIES Tool Assessment	Assessment of how management practices currently impact ecosystem services using an evidence-based tool. ⁷ This can also be used to assess any proposed changes to management.	Time required: approx. 0.5hr Should be updated every 3-5 years (or when management changes are made)	Can be carried out at any time of the year
Biodiversity Net Gain (BNG)	The Natural England Biodiversity Net Gain Metric (currently v3.1) can be used to compare data for the site pre-construction with the data collected during monitoring to assess changes in habitats and net gain achieved.	Time required: approx. 2-4hr Should be updated every 3-5 years (or when management changes are made)	Calculation of BNG during operation may be a requirement under trading.
Detailed Soil Analyses	More detailed analysis undertaken in the field or some samples sent to a laboratory. This may include soil bulk density, soil infiltration capacity and soil organic carbon (SOC). Other specialist laboratories may be used to look at microbial/fungal communities.	Time required: 1hr to collect samples Should be repeated every 5 years	Can be carried out at any time of the year
On and Offsite Water Survey	Monitoring of basic water parameters in water features on site and any features off-site that could be impacted by the solar farm. Use a handheld water quality measure to measure multiple parameters including temperature, dissolved oxygen, turbidity and conductivity.	Time required: approx. 15 min per water feature Should be repeated every time on site given variability in measures	Ensure the meter is calibrated. There is also potential to take samples and send for analyses for other parameters, such as nitrogen and phosphorous.

6. <https://www.wildpower.org>

7. <https://www.lancaster.ac.uk/spies/>

<p>Pollinator Survey – butterfly and bumblebee transects</p>	<p>Butterfly and bumblebee transect surveys involve a surveyor walking a pre-determined 100m transect route through the site and noting all butterflies and bumblebees within an imaginary 5m X 5m quadrat in front of them. 10 transects spread across the site is usually suitable</p>	<p>Time required: approx. 2–3hrs Should be repeated every 2–5 years</p>	<p>The survey does not require specialist ID skills and species can just be counted (i.e. “butterfly species 1”). The survey is weather dependant and needs to be carried out during warm, dry, still weather. 2–3 visits in a single year would give best results. However, can be done in a single visit if conditions are suitable. Can be carried out April to September inclusive, however, we suggest standardising to June/July</p>
<p>Breeding Bird Survey</p>	<p>Between 2–6 visits to the site conducted April to June and following the new bird survey guidelines.⁸ The number of surveys will depend on the level of detail required.</p>	<p>Time required: approx. 1–2hr per 15–20 ha per survey (although site dependant) Should be repeated every 2–5 years</p>	<p>The survey should avoid heavy rain or strong wind. Specialist bird ID skills are required in order to identify birds by sight and sound. Can be carried out March to early July inclusive (and from half an hour before sunrise to 11am). If only 2 surveys conducted, best carried out April/May (weather dependant)</p>
<p>Wintering Bird Survey</p>	<p>Between 2–3 visits to the site conducted November to February to assess how birds utilise the solar farm and its boundaries over winter.</p>	<p>Time required: approx. 1hr per 15–20 ha per survey (although site dependant) Should be repeated every 2–5 years</p>	<p>The survey should avoid heavy rain or strong wind. Specialist bird ID skills are required in order to identify birds by sight and sound. Can be carried out November to February inclusive</p>
<p>Other Species-Specific Surveys</p>	<p>Other surveys may be included within the monitoring where there are known records, habitat is managed with a focus on that species or due to local conservation priorities/planning obligations. This may include:</p> <ul style="list-style-type: none"> • Nocturnal/dusk bird surveys • Reptile surveys • Bat surveys (activity surveys or checks of roosts) • Amphibian surveys (including great crested newt) • Dormouse surveys • Harvest mouse surveys • Hedgehog surveys • Badger surveys • Otter/water vole surveys • Invertebrates • Earthworms • Surveys to assess grazing productivity such as above ground biomass or forage quality (above ground biomass calculation) 		

8. Bird Survey & Assessment Steering Group (2021). Bird Survey Guidelines for assessing ecological impacts. <https://birdsurveyguidelines.org>



Published in the United Kingdom by Solar Trade Association
Chapter House, 22 Chapter St, London, SW1P 4NP
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