

## Enhancing Solar Farms on Former Arable Land for the Benefit of Butterflies

Solar farm developments can offer an opportunity to enhance former arable land for the benefit of wildlife including; butterflies, moths, bees, mammals, reptiles, birds and amphibians. The creation of hedges, grassy edges and wildflower strips between PV modules can provide habitat for a range of species.

Incorporating biodiversity into solar farms has additional benefits such as; increased public interest, provision of grazing for livestock and good vegetation cover can protect soil and water-courses.

The placement of solar farm developments should be sensitive to nature conservation areas and landscapes. Solar farms should utilise previously developed land such as; Brownfields, industrial land or agricultural land. During development of solar farms, the 10 commitments of best practice set out by the Solar Trade Association should be referred to.

When creating habitat for Butterflies the following should be considered; adult nectar sources, larval foodplants growing in the right conditions (Table 1), shelter (warm conditions), overwintering/hibernation sites (dense vegetation/grass tussocks). The above can be achieved by retaining or creating hedgerows, planting suitable wildflowers/grasses and then managing these appropriately resulting in a varied sward structure.

### Hedgerows

Hedgerows have a number of benefits; they provide larval foodplants, shelter, nectar sources, supply berries for birds and mammals and can reduce the visual impacts of a solar farm.

#### **Creation and management of hedgerows:**

- Consider age, size and structure and retain or increase the number of standard hedgerow trees
- If planting or gapping-up a neglected hedge then choose native trees and shrubs of local origin
- Encourage the development of a tall hedge with thick base leading into a wide grassy margin
- During management avoid close cutting, severe flailing and annual trimming
- Best management involves periodic hedge-laying with occasional trimming
- Alternatively, cut hedges in late winter (January to March) before nesting season, on a 2-5 year rotation, protecting standard trees when cutting
- Wider and taller tree growth should be encouraged in some areas, particularly hedge intersections
- If Elm is present conserve Elm trees and suckers and clip after July

#### **Typical hedgerow species:**

- Blackthorn
- Buckthorn (Brimstone larval foodplant)
- Elm (White-letter Hairstreak larval foodplant)
- Holly (Holly Blue larval foodplant)
- Hawthorn
- Barberry

## Edges and Wildflower Strips

Grassy margins are important when enhancing land, grasses are larval foodplants for many butterfly species (Table 1) and wide grassy margins can incorporate taller vegetation, adding variety to sward structure. Taller vegetation can offer shelter and hibernation sites for invertebrates, birds, reptiles and mammals. Adding wildflowers to the margin can also provide nectar sources and larval foodplants.

The margin should be located around the site next to hedgerows and measure a minimum of 1-2 metres wide, wider margins (4-6 metres) can incorporate more habitat and reduce shading from hedgerows onto PV modules.

Between the PV modules incorporate a nectar-rich wildflower habitat. This can be managed annually, providing additional nectar sources, larval foodplants and structural variety in sward.

### Creating edges and wildflower strips

Prior to sowing or planting the soil may need to be prepared by intensive grazing or herbicide treatment for a year to reduce the risk of competitive weeds setting seed.

#### **Sourcing Seed:**

When natural regeneration is not feasible (unlikely on former arable land), species rich grassland can be created using seed harvested locally by brush harvesting, vacuuming or using green hay, there are advantages to using these methods (cost effective, local provenance). It is important to source this seed rotationally, on a small-scale and with appropriate permissions. Seeds can be purchased from suppliers such as Boston Seeds.

Important considerations when sourcing seeds and plants:

- Seed/plug plants should always be native provenance
- Seed/plug plants should not be introduced on to sites with rich flora or another important habitat
- Consider appropriate species for the site characteristics, location and ecological sensitivity
- Wildflower and grass species which benefit butterflies have been suggested, however seek advice from the supplier/technical specialist who can suggest advisable sowing rate, ratio and species for the soil type and current land use.

Suggested species including some larval foodplants and various nectar sources are listed below:

#### **Grasses:**

- Common Bent
- Creeping Red Fescue
- Sheep's Fescue\*
- Smooth-stalked Meadow Grass\*
- False Brome
- Cocksfoot
- Yorkshire Fog
- Crested Dogstail\*
- Chewings Fescue\*

#### **Wildflowers:**

- Agrimony
- Black Medick
- Bird's-foot-trefoil
- Common Sorrel
- Common Vetch
- Field Scabious
- Garlic Mustard
- Lesser Knapweed
- Lady's Bedstraw
- Ox-eye Daisy
- Red Clover

The grassy margin can be sown at a ratio of 80% grasses and 20% wildflowers.

The wildflower mix between PV panels can include a higher proportion and variety of wildflowers and the grass species in this mix should be low-growing fescues (suitable species are marked with \*).

Retain or add dense nettle patches growing in sunny, sheltered situations in the grassy margin, nettles provide foodplants for Small Tortoiseshell, Red Admiral, Comma and Peacock.

### **Management of Edges and Wildflower strips**

Seeds can be sown by hand or machine in autumn (or spring), perennials can take at least a year to establish, and habitat is initially likely to be dominated by annual weeds. Therefore regular intensive grazing or mowing (removing cuttings) is usually required through the first year to minimise competition and reduce annual weeds setting seed.

After the first year management by mowing or grazing is important to maintain diversity. Management will depend on growth rate and soil fertility, different management can create different sward structure. However, it is important any management is rotational (e.g. not mowing the whole site in any one year) to avoid a complete loss of habitat.

### **Management guidelines:**

- In the grassy margin leave an uncut strip next to the hedgerow, this can develop into dense vegetation with tussocks, and can be managed on rotation when required. The width of the uncut strip will depend on the margin (e.g. in a 6 metre margin leave 2-3 metres uncut).
- The remainder of the wide, grassy margin can be cut annually in autumn or every 2-3 years on rotation depending on site characteristics
- The wildflower strips between PV modules can be topped or grazed annually in autumn to retain flowering species
- Clippings should be removed if possible, but a few days after mowing to allow seeds to drop and invertebrates to escape
- Smaller grazing animals such as sheep are often used as larger animals can be impractical, sheep grazing can result in a short sward so should be light.
- If grazing the site then consider fencing off the wide grassy margin

**Table 1: Butterflies, foodplants and habitat requirements**

Species	Larval Foodplant	Habitat Condition
Small Skipper, Essex Skipper	Yorkshire Fog	Tall grassland
Large Skipper	Cocks-foot	Tall, sometimes damp grassland
Dingy Skipper	Common Bird's foot-trefoil	Varying sward height (short/medium) and bare ground
Grizzed Skipper	Agrimony, Creeping Cinquefoil, Wild Strawberry and Bramble	Varying sward height (short/medium) and bare ground with taller areas and spring nectar plants
Brimstone	Buckthorn, Alder Buckthorn	Scrubby grassland, woodlands and hedges
Large White, Small White	Cultivated Brassicas	Gardens, allotments, arable fields
Green-veined White	Wild Crucifers (e.g. Garlic Mustard)	Damp, lush vegetation
Orange-tip	Cuckoo Flower, Garlic Mustard	Damp, grassy vegetation
Green Hairstreak	Common Rock-rose, Gorse, Broom, Common Bird's-foot-trefoil, Bilberry	Sheltered grassy or scrubby vegetation
White Letter Hairstreak	Elms (including sucker re-growth)	Hedges, scrub, rides and isolated trees.
Small Copper	Common Sorrel, Sheep's Sorrel	Warm, dry situations in a variety of habitats
Common Blue	Common Bird's-foot-trefoil	Sunny, sheltered, grassy vegetation
Holly Blue	Holly, Ivy	Hedges, field margins, woodland rides, gardens and parks
Red Admiral	Common Nettle	Sunny sheltered situations
Small Tortoiseshell	Common Nettle, Small Nettle	Sunny sheltered situations
Peacock	Common Nettle	Sunny sheltered situations
Comma	Common Nettle, Hop, Currants, Elms	Open woodlands, woodland edges, gardens
Speckled Wood	False Brome, Cocks-foot, Yorkshire Fog	Tall, shady, grassy vegetation in woodlands and hedges, parks and gardens
Wall	False Brome, Cock's-foot, bents, Wavy Hair-grass, Yorkshire Fog	Short open grassland with broken or stony turf
Marbled White	Red Fescue, Sheep's Fescue, Yorkshire Fog, Tor-grass	Tall, unimproved grassland
Gatekeeper	Fescues, Common Couch, bents and meadow grasses	Tall grassland near hedges, rides and scrub
Meadow Brown	Fescues, bents and meadow-grasses, Cock's-foot, False Brome	Open grassland
Ringlet	Cock's-foot, False Brome, Tufted Hair-grass, Common Couch, meadow grasses	Slightly shady, tall, damp grassland
Small Heath	Fescues, Bents and meadow-grasses	Dry, well-drained, short, sparse vegetation