

Biodiversity in solar parks - a nationwide field study

The initial results of the current study

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With “Biodiversity in solar parks - A nationwide field study”, the [Bundesverband Neue Energiewirtschaft \(bne\)](#) is continuing its study “[Solar parks - Gains for biodiversity](#)” from 2019.

In this project, we focused primarily on the evaluation of expert reports and the investigation of solar parks on conversion sites. This time, we are significantly expanding the scope of the field investigations and concentrating on systems located on agricultural land. It is at these very locations that the majority of new PV installations take place.

With this study, we want to create an up-to-date database on the current state of biodiversity in ground-mounted PV systems (PV-FFA). How and by which plants and animals are the plants colonized? We also want to draw conclusions about the influence of construction, farming and other factors on biodiversity.

To ensure that our study can also be used as a database, it will be published in a special format. In addition to the study document, there will be a fact sheet for each plant examined, in which the most important parameters (e.g. row spacing), documents from the construction planning and the respective test reports are stored. The fact sheets will be freely available and downloadable from the [SonneSammeln](#) website.

A total of 25 solar parks in 10 federal states in Germany and one plant in Denmark were examined. The investigations were carried out by seven professional expert offices as well as the authors Rolf Peschel and Dr. Tim Peschel. From April to September 2024, a total of eight species groups, including birds, amphibians and plants, were mapped there. In addition, expert reports from around 60 PV-FFAs are expected to be evaluated and incorporated into the study results.

The initial results presented here are mainly based on the two authors' studies on plants, butterflies and grasshoppers. These are preliminary results. The expert reports of the commissioned offices are not yet complete. Only in the final study will the results presented here be conclusive and presented in an overall context.

Plants

354 different plant species were recorded in 22 PV-FFAs. These include endangered species such as the Austrian speedwell (*Veronica austriaca*) or the yellow-white resting herb (*Helichrysum luteoalbum*) as well as species that occur in fringes and forests. A cooler, more humid climate prevails under the modules, allowing strawberries (*Fragaria vesca*), raspberries (*Rubus idaeus*) and foxglove (*Digitalis purpurea*), for example, to grow there.

The evaluation of the species identities based on Jaccard shows that the solar parks are very different in terms of their vegetation. For example, the PV-FFA Effenricht and Hollerstetten have a maximum similarity of only 50 percent to each other, see Figure 1. These are only about 15 kilometers apart. All other plants are less similar to each other. This result indicates that each PV-FFA has an individual species composition and therefore individual maintenance concepts may be advisable.

Fundort	Büttel 2 PVA	Effenricht PVA	Eichensee PVA	Fichten PVA	Freimersheim PVA	Georgsdorf PVA	Gottesgabe PVA	Hollerstetten PVA	Klein Rheide PVA	Kühnhausen PVA	Lauterbach PVA	Lottorf West PVA	Maßbach PVA	Melkof PVA	Nunkirchen PVA	Ramsthal PVA	Ringköbing PVA	Salmtal PVA	Salzwedel PVA	Seifertshofen PVA	Wörnitzhofen PVA	Zobersdorf PVA	
Büttel 2 PVA																							
Effenricht PVA	8,1%																						
Eichensee PVA	6,1%	43,9%																					
Fichten PVA	9,5%	38,2%	42,3%																				
Freimersheim PVA	8,7%	31,6%	40,0%	26,7%																			
Georgsdorf PVA	8,3%	12,3%	12,6%	10,1%	15,8%																		
Gottesgabe PVA	3,1%	24,8%	18,8%	18,8%	20,3%	11,4%																	
Hollerstetten PVA	7,6%	50,0%	48,5%	40,0%	36,8%	9,5%	20,3%																
Klein Rheide PVA	10,5%	26,5%	23,0%	25,0%	25,2%	22,4%	22,9%	26,2%															
Kühnhausen PVA	9,6%	42,2%	38,9%	37,4%	32,7%	10,3%	17,7%	47,3%	20,2%														
Lauterbach PVA	7,5%	32,7%	36,4%	27,4%	30,9%	12,0%	20,4%	46,9%	23,5%	29,8%													
Lottorf West PVA	24,0%	7,6%	5,5%	7,9%	7,1%	5,8%	3,4%	8,3%	11,3%	7,8%	6,9%												
Maßbach PVA	4,6%	26,5%	26,0%	28,6%	25,0%	11,1%	18,6%	33,7%	20,0%	19,0%	28,1%	7,7%											
Melkof PVA	23,3%	14,4%	12,5%	13,7%	14,7%	9,9%	9,6%	11,4%	22,5%	13,1%	11,7%	24,5%	7,9%										
Nunkirchen PVA	11,4%	23,7%	25,8%	20,4%	23,5%	11,5%	20,2%	23,5%	20,4%	28,6%	25,3%	7,7%	16,3%	13,9%									
Ramsthal PVA	5,8%	25,2%	29,9%	22,3%	31,1%	7,7%	18,6%	33,7%	20,0%	28,4%	23,0%	7,7%	28,1%	10,3%	25,0%								
Ringköbing PVA	8,7%	15,5%	16,0%	16,0%	16,8%	7,0%	13,0%	16,8%	22,2%	15,7%	15,2%	11,7%	10,2%	16,2%	20,3%	21,3%							
Salmtal PVA	13,9%	27,3%	23,1%	19,6%	29,9%	17,0%	11,1%	27,0%	22,9%	22,6%	27,6%	17,1%	23,4%	18,4%	18,8%	17,7%	15,3%						
Salzwedel PVA	4,8%	26,5%	27,4%	22,2%	30,0%	15,4%	28,9%	23,8%	26,7%	24,1%	25,5%	4,0%	18,5%	15,2%	26,7%	17,2%	15,0%	17,5%					
Seifertshofen PVA	10,3%	30,2%	28,2%	23,9%	28,3%	17,1%	15,6%	26,9%	27,4%	29,7%	27,7%	13,6%	22,8%	21,5%	25,8%	22,8%	15,9%	21,4%	27,8%				
Wörnitzhofen PVA	14,1%	31,1%	35,3%	26,4%	31,9%	15,2%	14,6%	27,8%	24,5%	29,1%	25,8%	15,9%	19,8%	26,9%	23,6%	25,6%	16,2%	27,9%	19,5%	36,5%			
Zobersdorf PVA	7,6%	29,0%	25,0%	24,1%	26,0%	16,7%	33,9%	27,8%	26,4%	19,1%	25,6%	8,1%	24,4%	14,2%	26,3%	24,4%	15,0%	20,2%	26,4%	23,7%	22,6%		
Max	24,0%	50,0%	48,5%	42,3%	40,0%	22,4%	28,9%	50,0%	27,4%	47,3%	46,9%	24,5%	33,7%	26,9%	28,6%	33,7%	22,2%	29,9%	30,0%	36,5%	36,5%	33,9%	
Min	3,1%	7,6%	5,5%	7,9%	7,1%	5,8%	3,1%	7,6%	10,5%	7,8%	6,9%	3,4%	4,6%	7,9%	7,7%	5,8%	7,0%	11,1%	4,0%	10,3%	14,1%	7,6%	

Figure 1: Trellis diagram of species identities according to Jaccard for plant species in solar parks

Grashoppers

Grasshoppers are an important source of protein for many species. This species group is therefore an important food source for breeding birds and reptiles, for example.

In the 23 PV-FFAs surveyed, 30 species of grasshopper were detected. That is around a third of all species found in Germany¹. These include, for example, the endangered wart-biter. Specialized species such as the marsh cricket (*Stethophyma grossum*) and marsh grasshopper (*Pseudochorthippus montanus*) have also been recorded in damp locations.

Between five and 14 species of grasshopper were recorded in each of the plants surveyed. As expected, the most widespread grasshoppers were found in most of the sites. The three most widespread species (nightingale grasshopper, Roesel's grasshopper, brown grasshopper) were found in 22 and 21 of the 23 sites surveyed respectively.

¹ <https://www.nabu.de/tiere-und-pflanzen/insekten-und-spinnen/heuschrecken/01466.html>

An initial finding on grasshoppers is that they apparently colonize PV-FFA very quickly in large numbers. In systems that were completed last year, large populations of several hundred specimens have already been found in just a few square meters.



Figure 2: Grasshopper on a solar module, photo by biologist Rolf Peschel

Butterflies

A total of 34 species of butterflies and damselflies were recorded in 18 PV-FFAs surveyed. Common species were also found in a correspondingly large number of plants. The small cabbage white butterfly was found in every plant surveyed, the common meadow butterfly in all but one.

The authors note that PV-FFAs, which are mostly installed on farmland today, develop an attraction effect for butterfly species that are comparatively common in the landscape in a relatively short time. The improvement in habitat quality is significant according to their findings, particularly in the case of systems on agricultural land where the initial situation is not suitable for butterflies.

Further observations

Location diversity

Solar parks offer a variety of locations and structures in a comparatively small area, which is increasingly lacking in the intensively used agricultural landscape in particular. The rows of modules create both shady-cool and sunny-warm areas. In some areas, the authors found permanent and temporary small bodies of water in which typical animal and plant species have colonized. They also found that the mostly gravel paths can also represent a structural element that is attractive to certain species.

Diversity of site and structural elements is the basic prerequisite for biodiversity in the PV-FFA and is therefore of great importance.

Rows of modules create coexistence in a small space

Due to the cooler, more humid climate under the module tables, species that are typical of forest or forest edge areas settle there. This applies in particular to the flora (see “Plants” section), but also to grasshoppers, for example. For example, wood crickets have been observed under the shady modules, while just a few meters away the blue-winged grasshopper uses the sunny spaces between the modules as a habitat.

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Birds adapt their behavior to solar parks

Like church towers in the past, solar parks are a new element in our cultural landscape that is being discovered and used as a habitat by more and more species over time.

Various bird species that have discovered solar parks as a new habitat have been recorded. Traditional bird species of the agricultural landscape such as skylarks and corn buntings are increasingly using solar parks as habitats and breeding grounds. Various species use the PV-FFA as a feeding habitat and fly to it several times a day. Special behaviors were also observed. For example, heron tracks were discovered under the module tables in the PV-FFA Salmtal, a facility with a temporary body of water. When hunting for amphibians, the heron finds itself in a situation in which it would have difficulty escaping in an emergency. In the PV-FFA in Georgsdorf, cwere also observed and filmed snapping at flying insects with their beaks open just a few meters above the ground.

The results of the commissioned expert offices are largely not yet available. The initial results presented here must therefore be regarded as provisional, as the final evaluation can only take place once all the data is available. The study will be published at a conference in spring 2025. Information on the publication and the factsheets can be found at www.sonne-sammeln.de.

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