A service to measure and improve biodiversity using satellite data for monitoring, evaluation and optimization of CAP greening initiatives

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The BirdWatch project is nearing its end. The platform has been built, tested and is currently updated, based on test user feedback.

This newsletter issue focusses on our habitat suitability monitoring and optimisation results as well as demonstration activities in our project region **Brandenburg, Germany**.

Among BirdWatch's output are concrete suggestions on agri-environmental measures suitable to improve the quality of farmland bird habitats.

This can be useful, e.g., in the planning of conservation and restoration activities. To validate this assumption, LUP visited Brandenburg's Ministry of Agriculture, Food, Environment and Consumer Protection in December.

We say "Goodbye"… but not forever.

The last three years have gone by faster than we initially thought. This is likely a feeling common among R&D projects.

Our last article will reflect on the past three years but also on how we envision BirdWatch's future.
Please don't hesitate to contact us, even if the project is now finished!

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BirdWatch is developing a service to monitor farmland bird habitat suitability covering the whole of Germany.

Some results have already been shown in our newsletter #5*.

On top, BirdWatch's workflow for the optimisation of habitat suitability has been applied to the German state of Brandenburg, to showcase the potential how a mathematical approach to the allocation of conservantion measures could inform policy making.

In 2019, Germany's Federal Agency for Nature Conservation released a report which showed that seven of the ten selected bird species in BirdWatch were classified to be vulnerable or (critically) endangered in Germany.

The species concerned are the Eurasian skylark, Meadow pipit, Black-tailed godwit, Whinchat, European turtle dove, Common starling and Northern lapwing. Furthermore, the population size of the Yellowhammer has also been declining between 2004 and 2016.

Brandenburg was selected as a test case for optimisation as it represents a part of Germany which is known for its extensive farmland and intensive agriculture.

The agricultural landscape is predominately characterised by large farm enterprises, which mostly grow arable crops, dominated by cereals and oilseeds.

It has been shown that there is still a high potential for habitat restoration for farmland birds, with 94.4% of the landscapes falling short of the EU Biodiversity Strategy's area target to achieve a landscape feature (LF) cover of 10%.

We selected several habitat optimisation scenarios for Brandenburg to demonstrate how different landmanagement strategies can improve habitats under varying conservation contexts.

This also allowed us to compare the current habitat status with the status associated with the three scenarios:

- management within Natura 2000 sites
- conservation planning in Special Protection Areas (SPAs)
- budget-constrained optimisation across Brandenburg.

*Download our newsletters here

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We followed the objective to determine the location at which the use of management should be adapted to maximise the habitat suitability of farmland bird species.

For the optimisation we considered only those agri-environmental measures which are funded in Brandenburg. All of them target grassland management, involving, e.g., the conversion of arable into cultivated grassland, the conversion of cultivated into permanent grassland or the delayed mowing of grassland.

Additionally, farmers are subsidised to turn parts of their fields into non-productive areas, via the measure 'Promotion of structural elements on arable land: field margins'. These field margins serve to protect arable biota, in particular the protection of endangered arable weeds.

There are also subsidies for large-grained legumes such as peas, lentils, legume-cereal mixtures and lupins.

The cultivation of protein crops serves to protect the soil, in particular to maintain soil fertility and improve soil structure, thus protecting the soil from wind and water erosion. The integration of protein crops into crop rotation also makes an important contribution to climate protection and adaptation to climate change by improving carbon and nitrogen sequestration and providing largely year-round soil cover through the change from summer to winter, which provides natural protection against evaporation.

We calculated the optimised allocation of these measures for each of the three scenarios and compared the habitat suitabilities "before" and "after" (Fig. 1).

Among the conclusions one could draw from our analysis are:

1. in case of our **SPA scenario**, the optimisation results show that distributing conservation resources across all SPA zones does not lead to meaningful ecological gain and that a broad, non-targeted allocation of measures can reduce conservation effectiveness. A targeted conservation within existing Natura 2000 zones could therefore be considered more effective in general.

2. The allocation of measures differ a lot between our three scenarios, especially in terms of the location where measures are being proposed.

3. The impact of implementing measures shows to be higher, when the area of protection for a species is already high to begin with.

More generally, our approach to habitat optimisation helps to reveal where and how management measures can most effectively improve farmland bird habitats, how to avoid harmful actions for co-occurring or endangered species, and how biodiversity gains can be maximised within realistic financial and policy constraints.
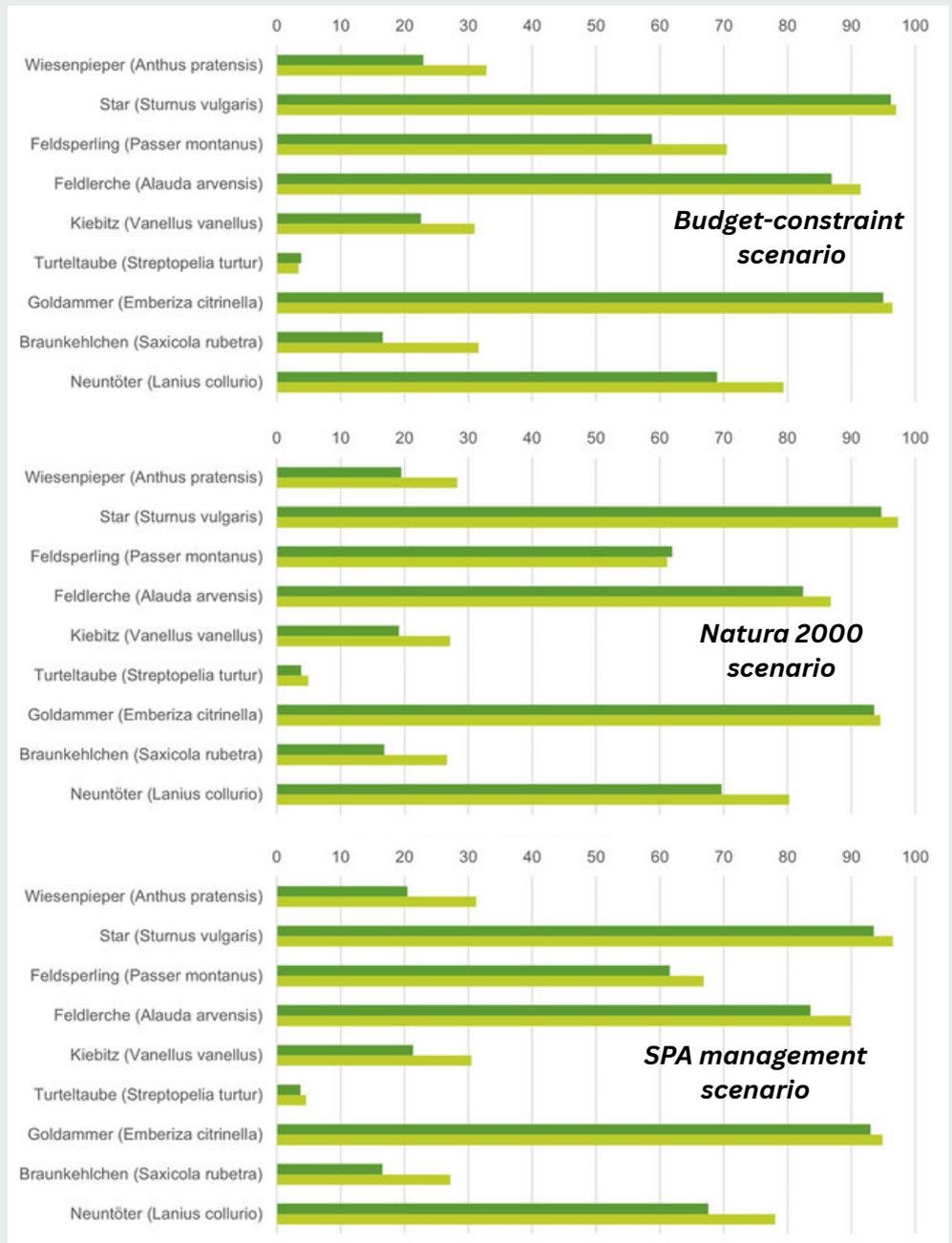

Figure 1: Current (dark green) vs. optimised (light green) habitat suitability for three scenarios; note that the values were extracted only for the farmland parcels which were assigned a specific measure; depending on the scenario, measures are allocated to different parcels, which leads to different initial values.

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We have also been busy exploring how we can show BirdWatch's output in an intuitive, user-friendly way.

Fig. 2 shows the habitat suitability for the Whinchat within a biosphere reserve in Brandenburg.

Figure 2: Habitat suitability for the Whinchat, within the biosphere reserve of the Spreewald; habitat suitability is only shown for the agricultural parcels within the area
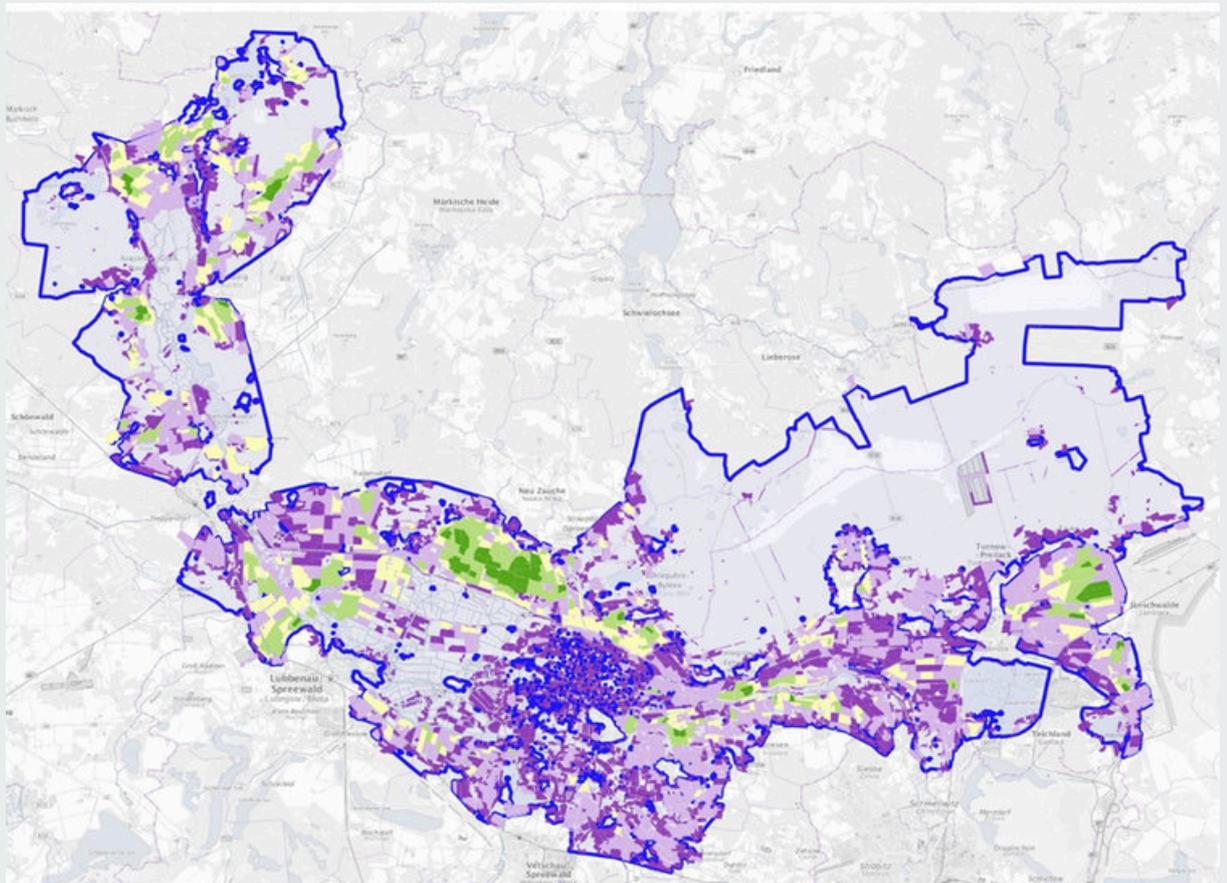
It not only depicts the distribution of the suitability of farmland as a Whinchat habitat, but also how this data is currently visualised on our BirdWatch platform.

With all the information which goes into model building but also the amount of information which forms the output of BirdWatch, a balance between "too much" and "too little" has to be found.

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End of last year, LUP visited the premisses of the Ministry of Agriculture, Food, Environment and Consumer Protection (MLEUV - Ministerium für Land- und Ernährungswirtschaft, Umwelt und Verbraucherschutz) to introduce BirdWatch to staff members of the MLEUV as well as of the Landesamt für Umwelt (LfU), the scientific authority on nature conservation, water and environmental protection of Brandenburg.

More specifically, the aim of the visit was to validate our assumptions on BirdWatch's potential to support policy-making, such as the design of species protection plans or the evaluation of the impact of agri-environmental measures.

The biosphere reserve of the Spreewald was used

as an illustrative case on how species protection plans could be supported by an evaluation of current habitat suitability along with an estimation and comparison of the potential impact of a set of feasible policy-scenarios.

For example, the scenarios could be used to estimate the area or number of farmland parcels on which measures can be implemented (Fig. 3).

Alternatively, the types of measures, associated with each scenario, can be compared.

Based on the preferences underlying a scenario, different measures are deemed the most appropriate.

This is illustrated in Fig. 4 on the next page. The predominance of certain selected measures reflects the preferences of the respective scenario (e.g., budget-, area-, species-focus).
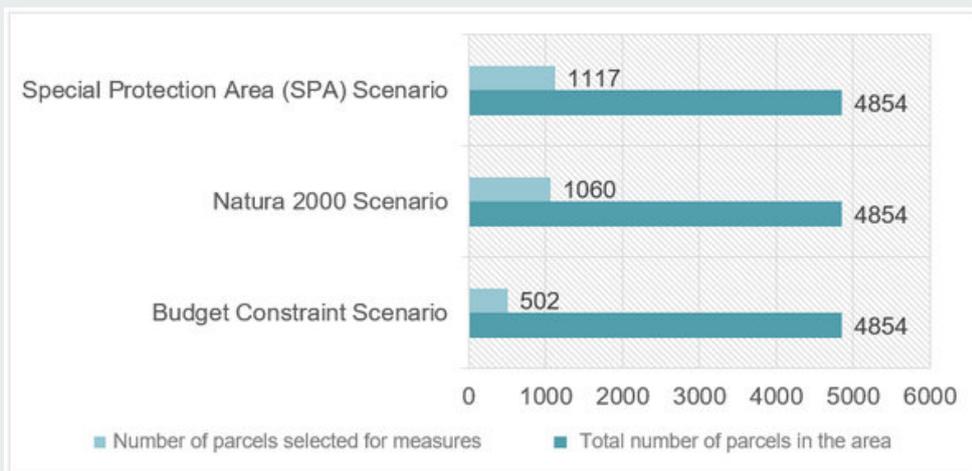

Figure 3: Comparison of the amount of farmland parcels on which agri-environmental measures could be implemented, based on different pre-calculated policy scenarios for Brandenburg
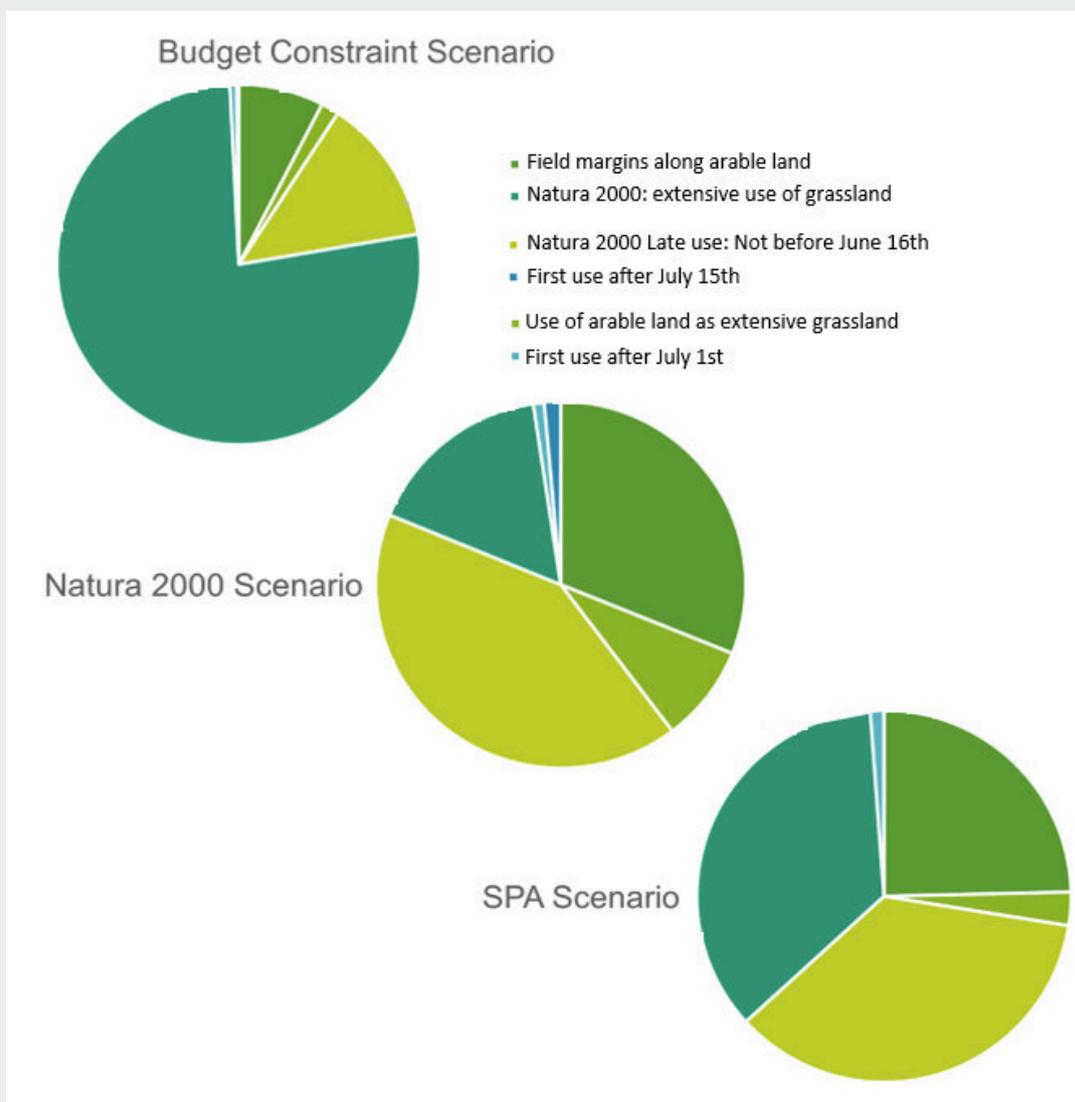
Figure 4: Comparison of the share of the selected measures per pre-calculated policy scenario for Brandenburg

Staff members of the MLEUV and LfU shared their thoughts on the information provided by the platform.

For example, they argued that habitat suitability and diversity indicators do not provide direct evidence of restoration success or species recovery. This means Birdwatch outputs should not be used as proof of compliance or ecological impact but rather as a screening and orientation tool that supports administrative planning and investigation.

All in all, Birdwatch is viewed by the MLEUV as a promising concept for decision support for public authorities, provided it is developed within a scientifically defensible and transparent framework.

In the context of the **EU's Nature Restoration Law (NRL)**, its main value lies in supporting evidence-based prioritization, spatial screening, and hypothesis generation.

According to LfU, from a regional administrative perspective, BirdWatch aligns well with the **Birds Directive's** and the **NRL**'s need for large scale, harmonized and repeatable assessments of habitat condition and trends. Birdwatch can help identify areas where restoration efforts may be most urgently needed or potentially effective. It might also help to identify cases in which a more fine-grained monitoring or targeted field assessments should be carried out. This makes it useful for planning, reporting and allocating limited resources.

The Horizon Europe project BirdWatch has come to an end.

The idea behind BirdWatch was already developed in the early 2010s. Several master theses were written before we brought BirdWatch to the level of a Horizon Europe Project. This is why, with the end of this particular project, we see it more as an end of a phase.

We started out with the idea to link satellite-derived image layers with location data on bird observations, to identify the factors which make farmland areas suitable for individual bird species.

This led to the development of our first BirdWatch web-app, covering the state of Brandenburg, Germany.

The first web-app essentially told us how the satellite's spectral signals look like at low or high habitat suitability.

This is more useful than it might sound, as proven by the number of data requests LUP received from researchers over the years.

With the Horizon Europe project BirdWatch, we wanted to link bird observations to specific farmland features and farm management activities, to identify and map which of them make farmland especially suitable and which do the opposite.

Information like this not only helps to assess the current state of farmland habitat suitability, create maps of hot spots or identify problematic areas, but also be a valuable input for long-term monitoring.

This also supports planning and evaluation activities, such as those needed in policymaking, as shown in the previous article in this newsletter.

In the last three years we learned the intricacies of exploring and evaluating bird habitat suitability across different countries, climates, topographies, prevalent land cover as well as prevalent farm and farm management types.

We also learned the challenges of understanding and capturing the specifics of national and regional policies which influence decision-making on farmland.

A regional approach, constrained, e.g., by the area covered by a set of agri-environmental policies, can balance out complexity and impact.

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This is also how we envision our way forward.

BirdWatch works best when combined with local and regional know-how, through the exchange with policymakers, practioners, ecologists, ornithologists, advisers or agricultural and environmental agencies.

This ensures that Bird-Watch's models capture the specifics of the area, to then support the information base on which decisions, be it policies or specific practices, are being made.

With BirdWatch, we specifically address policymakers, authoritities with supervisory functions such as paying or environmental agencies, policy-informing research, advisers on farm-management and nature conservation or more generally on individuals or organisations commissioned to carry out regional- or national-scale planning.

Going forward, it is our aim to start conversations with regional or national stakeholders across the EU, to scope the possibilities, goals, regulations and constraints to restore and maintain the quality farmland and to discuss the environmental and socio-economical needs which will need to brought into harmony, to allow for a truly sustainable agriculture.

Image source: Susanne Seidel, Rémy Schaepman

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Don't hesitate to get in touch with us!

Project Management

Dr. Annett Frick
Mail: annett.frick@lup-umwelt.de
Tel: +49 331 275 77 60

Dr. Nastasja Scholz
Mail: nastasja.scholz@lup-umwelt.de
Tel: +49 331 275 77 0

Project Lead

LUFTBILD UMWELT PLANUNG

Luftbild Umwelt Planung GmbH
https://www.lup-umwelt.de

Consortium

eurac research

Eurac Research Institute for Earth Observation
https://www.eurac.edu/en

SINERGISE

Sinergise laboratory for geographical information systems, Ltd.
https://www.sinergise.com

Universität Potsdam

University of Potsdam
https://www.uni-potsdam.de/

vito

VITO - Vlaamse Instelling voor Technologisch Onderzoek
https://vito.be/en

NPA NATIONAL PAYING AGENCY

National Paying Agency under the Ministry of Agriculture of the Republic of Lithuania
https://www.nma.lt

Bioland

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