Shaggy solitary bee (*Panurgus calcaratus*)

Policy Brief

Strengthening Pollinator Conservation in EU Protected Areas and Natura 2000 sites

Auriane Flottes de Pouzols & Evelyn Underwood (Institute for European Environmental Policy)

SAFEGUARD

Safeguarding European wild pollinators

The Safeguard project receives funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 101003476

Main findings

If managed effectively, Europe's protected areas and Natura 2000 sites can support diverse pollinator communities, improve plant fitness, strengthen ecosystem resilience and the essential pollination services they provide. Local habitat quality, especially **high flower cover and plant species richness**, strongly enhances wild pollinator diversity and stabilises pollination services. Increasing crop cover, however, shifts communities towards common species and reduces rare pollinators, while the presence of managed honeybees can intensify competition and narrow wild pollinator foraging niches.

If managed appropriately, diverse and high-quality habitats can greatly strengthen pollinator communities and the essential pollination services they provide. Local flower richness increases wild pollinator diversity and plant fitness, while increasing crop cover and competition from managed honeybees reduce niche breadth and lead to the loss of rarer species. Well-connected, species-rich grasslands and structural landscape elements such as hedgerows, field margins, and smaller fields support more solitary bees and butterflies, showing that habitat quality, connectivity, and landscape diversity are key to maintaining resilient pollinator populations.

Key policy recommendations

- **Integrate pollinators into Natura 2000 network management and nature restoration planning** – map and measure pollinator populations in protected areas, include typical pollinator species in Annex I habitat condition surveying, design targeted restoration measures for key pollinator habitats in Natura 2000 sites and other protected areas in the national nature restoration plan.
- **Use CAP support for flower-rich habitat cover and connectivity within and around Natura 2000 sites** – set targets for area support for flower-rich habitats and for restoring Annex I grasslands in line with the national nature restoration plan, design targeted support schemes for semi-natural grasslands with actions that address pollinator needs. Focus on habitat quality as well as area.
- **Adapt protected area management to include pollinators** – identify typical species in each habitat and site, build in actions for ecological connectivity, manage honeybee hives to avoid competition, improve habitat quality around protected areas.

Context

Wild pollinators are in crisis from multiple pressures acting together

In recent years, there has been a significant and alarming decline in pollinating insect populations across Europe, including bees, hoverflies, butterflies, and moths. This phenomenon, often referred to as the "pollinator crisis," has raised serious concerns due to the critical role insects play to maintain healthy ecosystems. Pollinators have ecological, social, and economical implications as it is estimated that they provide EUR 15 billion[1] of the EU's annual agricultural output. Improving the management of Natura 2000 sites and other protected areas is essential to reversing pollinator decline.

The EU Pollinators Initiative defines actions for Natura 2000 and pollinator habitats

In response to this growing crisis, the European Commission launched the **EU Pollinators** Initiative in 2018, following a call from the **European Parliament** and the **Council**. The initiative aims to enhance scientific understanding of insect pollinator decline, address its main causes, and foster collaboration among all relevant stakeholders. The EU Pollinators Initiative defines actions to improve pollinator habitats and to strengthen the coherence and connectivity of Natura 2000 sites for pollinators. The EU Habitats Directive and the Natura 2000 network protect flower rich grasslands and other priority habitats for pollinators. Now the EU Nature Restoration Regulation mandates national restoration plans, which must include measures to reverse pollinator decline. Implementing targeted, pollinator-friendly interventions that reflect the need at both the local and/or landscape level can help restore habitats, enhance biodiversity, and support resilient pollinator populations.

Safeguard research clarifies pressures on pollinator habitats and best management practices

The Safeguard Horizon 2020 project has researched the direct and indirect drivers of pollinator decline in Europe and assessed their environmental, economic and social impacts. Through a comprehensive reassessment of the status and trends of European wild pollinators, the project developed an integrated assessment framework to inform more effective policy management responses. Safeguard research evaluates the effectiveness of multiple interventions across semi-natural, agricultural and urban landscapes, generating evidence on which measures work, where, and under what conditions. The research provides key insights into the types, combinations, and spatial arrangement of interventions best suited to different management objectives, offering a strong evidence base to support targeted and context-specific pollinator conservation policies.

1 Gallai, N., Salles, J. M., Settele, J., & Vaissière, B. E. (2009). Economic valuation of the vulnerability of world agriculture confronted with pollinator decline. *Ecological economics*, 68(3), 810–821.

Key results from Safeguard

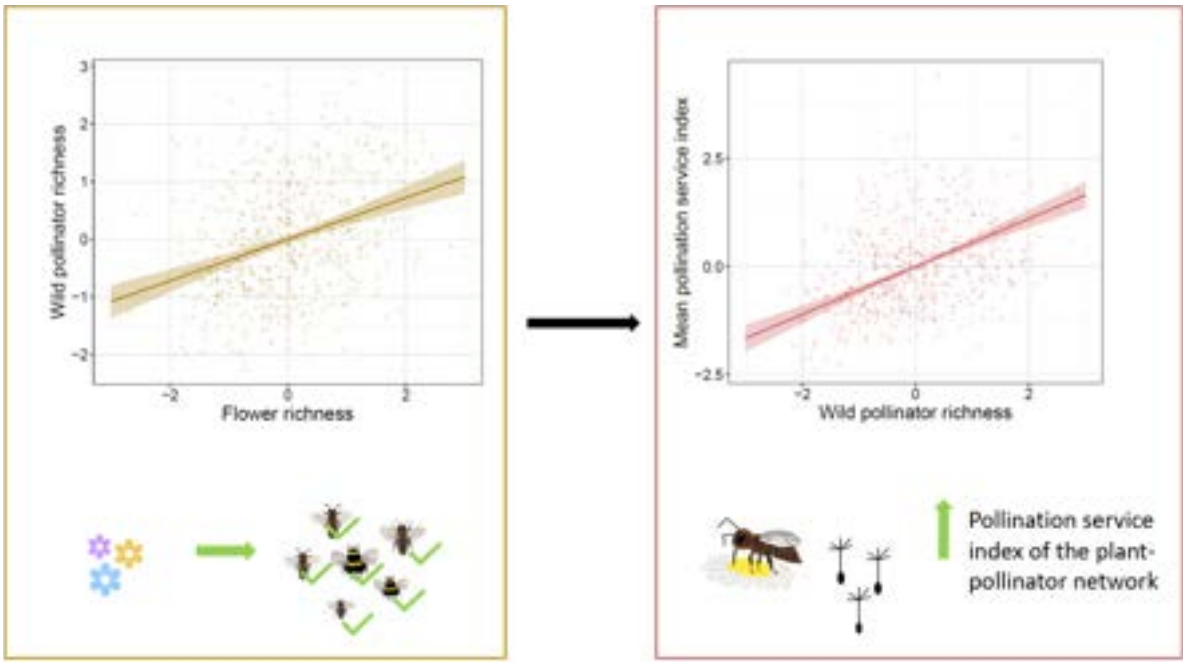
Factors that influence the presence of pollinators in semi-natural habitats and Natura 2000 sites

Landscape and local pressures – amount of crop cover and local flower richness – influence network structure by changing pollinator community composition and foraging behaviours. Maurer & Albrecht (2025) reveal that as crop cover (i.e. arable fields) in the landscape increases, pollinator communities shift toward being dominated by common species, and rare species are lost, while a high local flower density increases wild pollinator diversity, which has positive effects on pollination services.

The **presence of managed honeybees** exerts competitive pressure on wild pollinators, shown by the increased modularity of the plant-pollinator networks (Maurer & Albrecht 2025). This means that wild pollinators narrow their foraging niches in response to the presence of honeybees, likely as a strategy to avoid direct competition.

At the local level, **large areas of calcareous grassland habitat** support greater numbers of solitary bees, butterflies, and endangered species of these pollinator groups, by offering increased access to food and nesting opportunities (Biegerl et al., 2025). This good resource availability can help facilitate the co-existence of pollinator species. Since most bee species in Central Europe nest in the ground, the extent of suitable nesting habitat plays a key role in maintaining their populations.

Figure 1. A high local flower richness promoted the richness of wild pollinators. This also affects pollination services to plants, approximated with the pollination service index (PSI) of plant-pollinator networks: A high wild pollinator richness increased the mean PSI. Drawings of pollinators and seeds: © Corina Maurer.



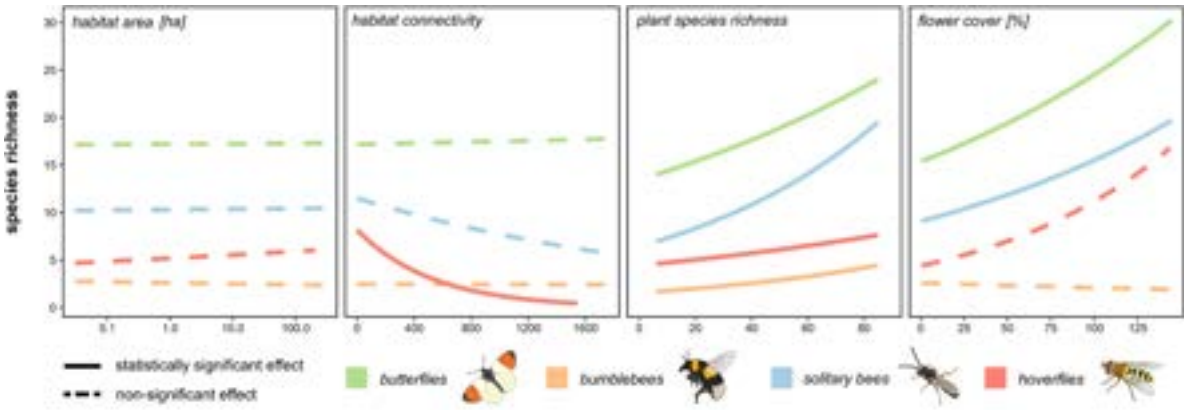
Meanwhile, at the landscape level, **habitat connectivity** positively affects endangered butterfly species by supporting their dispersal and colonisation, which helps reduce extinction risk in fragmented habitats (Biegerl et al., 2025). This pattern, also observed in other semi-natural grasslands, highlights the role of connectivity in maintaining butterfly populations. This may also apply to solitary bees when the expansion of calcareous grasslands is not feasible.

High quality and well-connected habitats support more pollinator diversity

There is **strong evidence that larger, high quality, and well-connected pollinator-friendly habitats** within the Natura 2000 site network are crucial for enhancing both plant fitness and pollinator diversity. Schweiger et al. (2025) found that habitat size was the most influential factor for improving all aspects of plant fitness. Expanding these habitat patches not only supports plant population viability but also benefits pollinators by promoting a higher degree of dietary specialization, which is often associated with endangered species. Improving local habitat quality, such as increasing flower densities, enhances pollen quality and genetic diversity in plant populations. Additionally, reducing the proportion of arable lands and promoting smaller fields featuring connecting elements will improve pollinator movement and long-term plant population viability.

Improving habitat quality, particularly **increasing flower cover and plant species richness** in Natura 2000 habitats, is more effective than simply increasing habitat area to promote pollinator friendly habitats (Boetzl et al., 2025). High flower cover increases resource availability and attracts pollinators across the landscape, while greater plant species richness supports a wider range of pollinators, including butterflies and solitary bees. Even in landscapes with limited natural habitat, enhancing existing sites can significantly boost pollinator species richness and densities. This concurs with the finding from other research (Fijen et al., 2025) that habitat quality consistently outperformed habitat amounts as a driver of pollinator diversity.

Figure 2. Species richness of butterflies, bumblebees, solitary bees and hoverflies in relation to semi-natural habitat area, semi-natural habitat connectivity as well as to the plant species richness and flower cover in the semi-natural habitats (marginal model predictions). While we found no effects of habitat area and higher habitat connectivity decreased the species richness of hoverflies, the species richness of all wild pollinator taxa increased with plant species richness and those of butterflies and solitary bees also with increasing flower cover in semi-natural habitats. Solid lines indicate statistically significant ($p < 0.05$) relationships across study regions, dashed lines non-significant relationships ($p > 0.05$). © Fabian Bötzl



Best management practices for protected areas and Natura 2000 sites

Extensive mowing or grazing are widely used methods that **improve habitat quality** by efficiently boosting food resources for pollinators (Süle et al., 2024). In some landscapes these methods are necessary to prevent scrub encroachment, while in other landscapes such as sub-alpine grasslands, abandonment is a successful pollinator-promoting intervention. For example, in calcareous grassland, keeping the area in an open state through mowing or grazing prevents scrub encroachment and improves the habitat quality for wild bees (Biegerl et al., 2025).

In landscapes, **structural features such as field margins, hedgerows, and small open paths** play a vital role in supporting pollinator populations. These elements can offer enhanced foraging and nesting opportunities due to their higher flower cover and lower levels of disturbance (Biegerl et al., 2025). One promising and practical strategy to further support solitary bees involves subdividing large crop fields into smaller units by adding flowering margins, hedges or trees. This approach can improve species richness not only within the agricultural matrix but also in adjacent high-value conservation areas. When combined with the establishment of new hedgerows and unmanaged field margins and the organic management of crop fields, such measures can significantly enhance structural diversity and ecological resilience at the landscape scale.

Figure 3. Various land management intervention types in arable lands, (a) sown *Onobrychis arenaria* (b) Hungarian grey grazing (c) sown flower parcel (d) edge of sown flower parcel © Gabriella Süle

Policy recommendations

Natura 2000 & nature restoration planning: The Nature Restoration Regulation provides a key opportunity to mainstream pollinator-friendly management within protected areas, particularly Natura 2000 sites and the Annex I habitats they protect. Biodiversity-friendly management should be prioritised across all habitats, regardless of size or location, to ensure functional ecological networks for pollinators.

- **Map and measure pollinator communities in Natura 2000 and other protected areas.** Establish national or regional pollinator mapping and monitoring programmes focused on Natura 2000 sites and other protected areas, using standardised indicators to track trends and restoration outcomes. The EU Pollinator Monitoring Scheme requires targeted monitoring of all bee, hoverfly and butterfly species that are assessed as critically endangered.

- **Integrate pollinator species as typical species in Annex I habitat surveys.** Ensure that habitat condition measurements record the presence of typical pollinator species in Annex I habitats, based on the forthcoming **PollHab** guidance.

- **Implement targeted restoration actions for pollinators and their habitats in Natura 2000 sites.** Identify and define restoration measures for habitats important for pollinators in Natura 2000 sites, especially open extensive grasslands. Promote management practices that enhance floral resources and nesting opportunities in grasslands and open habitats, such as extensive mowing and grazing, flower sowing, and some disturbance to create and keep open areas for nesting sites, such as rocky or sandy patches. Protect veteran trees in forests and in field margins and green spaces for their specialised hoverfly species.

Common Agricultural Policy support: The planning for the 2028–2034 Common Agricultural Policy programmes is an opportunity to set targeted and quantifiable measures to promote pollinator-friendly interventions in protected areas and Natura 2000 sites.

- **Set CAP policy targets for support for flower-rich habitat cover and connectivity within and around Natura 2000 sites.** Define quantified targets under national CAP Strategic Plans for area to be supported to create and maintain flower-rich and semi-natural habitats required to sustain pollinator diversity and ecosystem resilience. This should be in line with the habitat restoration targets in the national nature restoration plan.

- **Design targeted support schemes for the conservation and restoration of semi-natural grasslands and calcareous habitats that support wild pollinators.** Design agri-environment-climate measures to fund restoration of calcareous grasslands, hay meadows, and other semi-natural habitats of high ecological value for pollinators. Pay attention to what needs to be done to ensure enough nesting opportunities and food resources for pollinators.

- **Increase the funding and targeting of agri-environment support to enhance habitat quality rather than habitat extent alone.** Ensure that agri-environment-climate funding prioritises management practices proven to increase pollinator richness, such as delayed or rotational mowing, and low-intensity grazing. Focus investment in restoration on sites with low flower density or degraded habitat.

White-tailed bumblebee (*Bombus lucorum*)

Protected area management: Protected areas are central to biodiversity conservation in Europe, but halting pollinator decline requires a stronger focus on habitat quality, functional connectivity, and compatible management with surrounding landscapes.

- **Prioritise habitat quality over area alone.** Focus management efforts on improving habitat quality within existing protected areas by tailoring site-specific practices that enhance floral diversity, nesting substrates, and microhabitat availability. Small habitat patches can be valuable if well-managed and functionally connected.
- **Maintain ecological connectivity within and between protected areas.** Ensure that protected area management considers patch size, spatial configuration, and connectivity to support viable pollinator populations and movement across the landscape.
- **Manage honeybee hives to safeguard wild pollinator communities.** Introduce management measures to regulate honeybee densities where necessary, preventing competition for floral resources and ensuring protected areas primarily support wild pollinator diversity.
- **Improve habitat quality in arable land adjacent to protected areas.** Promote pollinator-friendly measures in buffer zones and surrounding farmland, such as sown fallows or set-aside areas, and wide, flower-rich buffer strips between cropland and forest edges, to reduce edge effects and enhance resource continuity.

References from Safeguard

Schweiger, O., Michalski, SG., Vujić A., Wogram S., Dominik, C. (2025). Impact of landscape composition and configuration on pollinator movement and plant reproduction. *Deliverable D2.5 EU Horizon 2020 Safeguard Project*, Grant agreement No 101003476.

Boetzl, F.A., Biegerl, C., Holzschuh, A., Krauss, J., Zhang, J. & Steffan-Dewenter, I. (2025). Report on pressures and suitability of different indicators of pollinator declines in Natura 2000 habitats. *Deliverable D2.3 EU Horizon 2020 Safeguard Project*, Grant agreement No 101003476.

Maurer, C. & Albrecht, M (2025). Synthesis report on the impacts of multiple pressures on plant-pollinator networks and functional consequences on pollination and plant reproduction. *Deliverable D2.2 EU Horizon 2020 Safeguard Project*, Grant agreement No 101003476.

Süle, G., Szigeti, V. & Báldi, A. (2024). Recommendations on how to implement effective interventions to enhance pollinators in Natura 2000 areas and in public space. *Deliverable D4.2 EU Horizon 2020 Safeguard Project*, Grant agreement No 101003476.

Biegerl, C., Holzschuh, A., Tanner, B., Sponsler, D., Krauss, J., Zhang, J., & Steffan-Dewenter, I. (2025). Landscape management can foster pollinator richness in fragmented high-value habitats. *Proceedings B*, 292(2040), 20242686.

Other references

Fijen, T. P., Bishop, G. A., Ganuza, C., Scheper, J., & Kleijn, D. (2025). Analyzing the relative importance of habitat quantity and quality for boosting pollinator populations in agricultural landscapes. *Conservation Biology*, 39(1), e14317.

Süle, G., Báldi, A., Kleijn, D., Steffan-Dewenter, I., Venn, S., Goulson, D., ... & Szigeti, V. (2025). Pollinator-promoting interventions in European urban habitats—a synthesis. *Ecology Letters*, 28(8), e70189.

European Commission (2025) Commission Delegated Regulation (EU) 2025/2188 of 19 September 2025 supplementing Regulation (EU) 2024/1991 by establishing a science-based method for monitoring pollinator diversity and pollinator populations. *Official Journal of the European Union*, L 2025/2188, 26 November. Available at: **http://data.europa.eu/eli/reg_del/2025/2188/oj**

Further resources

To follow the most recent EU pollinator updates, see the **EU Pollinator Information Hive**

Safe-Hub (Safeguard Knowledge Exchange Hub): The latest pollinator research and resources

EU Pollinator Monitoring scheme: Commission Delegated Regulation (EU) 2025/2188

PollHab project identifying typical species for Annex I habitats

Technical guidance on surveying and monitoring habitat condition of Annex I habitats: ATECMA & DAPHNE (2025) Technical Guidelines for assessing and monitoring the condition of Annex I habitat types of the Directive 92/43/EEC. Publications Office of the European Union, Luxembourg

Species of hoverfly (*Temnostoma bombylans*) | ©Michael Meijer

SAFEGUARD

Safeguarding European wild pollinators

@safeguardproject.h2020

Safeguard Project

safeguard-pollinators.eu

Designed by PENSOFT