EU Pollinator Initiative

– What will success look like?

- Buglife – The Invertebrate Conservation Trust
- Butterfly Conservation Europe
- Friends of the Earth Europe
- Vlinderstitchting (Dutch Butterfly Conservation)
- Environmental Justice Foundation
- River of Flowers
- Conchological Society
- Bumblebee Conservation Trust
- Freshwater Habitats Trust
- Wildlife Trusts
- Client Earth
- Wildfowl and Wetland Trust
- Mammal Society
- Save Butterfly World
- Pollinis
- A Rocha
- Edinburgh Entomological Club
- People's Trust for Endangered Species
- Plantlife
- British Arachnological Society
- RSPB
- Bijenstichting (Dutch Bee Conservation)
- Badenoch & Strathspey Conservation Group
- Amateur Entomologists' Society
- SOS Polinizadores (SOS Pollinators)
- Federation of Irish Beekeepers' Associations
- Vilde bier i Danmark (Danish Association for Native Bee Conservation)
- British Dragonfly Society
- Butterfly Conservation

The above organisations have agreed the following response regarding the EU Pollinators Initiative.

Background

Invertebrates are the very heart of our ecosystems and their precipitous decline presents a crisis for agriculture and the health of the environment across the EU. A successful programme of environmental regulation, sustainable management of remaining high-value pollinator habitats and habitat restoration, targeted at reversing the declines of pollinators is an essential step towards securing sustainable ecosystem function and will, along the way, address many of the factors causing biodiversity decline.

Declines in European flying bees, moths and other pollinators, such as the 76% decline in insect biomass in 27 years on German nature reserves[1], bee and hoverfly declines[2], the decline of butterflies and moths in the Netherlands[3] and UK[4] [5] and the 30% decline in the abundance in EU grassland butterflies in 25 years[6] are amongst the most severe of modern biodiversity declines so far documented.

For many species the situation is now critical, the European Red Listing process found that 9% of bees and butterflies and 11% of beetles are already threatened with extinction[7] [8] [9]. Even the 56 pollinator species (butterflies, and some of the moths and beetles) listed on the Habitats Directive are doing badly, 67% of the assessments are unfavourable and 55% of their trends are negative (only 8% positive).

The main drivers of pollinator decline are the loss and degradation of habitats, linked particularly to the agricultural intensification, especially the use of pesticides and fertilisers, and abandonment, which leads to scrubbing up of semi-natural grassland. The reversal of habitat fragmentation and degradation is an essential step. However, there are other drivers that must also be addressed if we are to save our pollinators. In particular, society must address the paucity of pollinator monitoring; increase scientific knowledge; address disease and invasive species risks; reduce light pollution and peat use; reduce ozone and NOx pollution levels; and improve the management of urban areas for pollinators.

It is estimated that 84% of EU crop species[10] and 78% of wildflower species[11] rely on insect pollination. The ecosystem service provided to the EU by pollinators is valued at €22 billion per

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[1] Hallmann CA, Sorg M, Jongejans E, Siepel H, Hofland N, Schwan H, et al. (2017) More than 75 percent decline over 27 years in total flying insect biomass in protected areas. PLoS ONE 12(10): e0185809. https://doi.org/10.1371/journal.pone.0185809.

[2] Biesmeijer, J. C., et al.. (2006) Parallel Declines in Pollinators and Insect-Pollinated Plants in Britain and the Netherlands. Science, Vol. 313, Issue 5785, pp. 351-354.

[3] Groenendijk, D. & Ellis, WN (2011). The state of the Dutch larger moth fauna. Journal of Insect Conservation, 15, 95-101

[4] Thomas J.A., et. al. (2004) Comparative losses of British butterflies, birds, and plants and the global extinction crisis. Science, 303, 1879–1883.

[5] Conrad K.F., Woiwod I.P., Parsons M., Fox R., Warren M.S. (2004) Long-term population trends in widespread British moths. Journal of Insect Conservation, 8, 119–136.

[6] Van Swaay, C.A.M., et al. (2016). The European Butterfly Indicator for Grassland species 1990-2015. Report VS2016.019, De Vlinderstichting, Wageningen.

[7] Nieto A., et al. (2014) European Red List of bees. Publication Office of the European Union, Luxembourg.

[8] Van Swaay, C., et al. (2010) European Red List of Butterflies. Luxembourg: Publications Office of the European Union.

[9] Nieto, A. and Alexander, K.N.A. (2010) European Red List of Saproxylic Beetles. Luxembourg: Publications Office of the European Union.

[10] Williams IH. (1994) The dependence of crop production within the European Union on pollination by honey bees. Agricultural Science Reviews; 6: 229-257.

[11] Ollerton J, Winfree R, Tarrant S. (2011) How many flowering plants are pollinated by animals? Oikos; 120(3): 321–326.

year[12]. Pollinators provide an excellent indicator of the health of our environment and underpin essential services.

Collapses in pollinator populations in China and parts of the United States have had big economic impacts and, if current trends continue, we will not have enough EU wild pollinators (in terms of both numbers and variety) for all the crops the growing population requires. Impacts on agricultural production are already being observed, for instance on apples in the UK[13] and oilseed yields in Finland[14], and are set to worsen unless the biodiversity decline is addressed[15]. Pollinators are also essential in pollinating Europe's wildflowers, which constitute the flower-rich semi-natural grasslands and other habitats on which Europe's wildlife depend – the decline of wild pollinators and wildflowers goes hand-in-hand. It is likely that downward spirals will worsen declines as fewer pollinators result in fewer flowers and larval food plants, creating a vicious circle with the potential for tipping points.

Without new and resolute action the decline of pollinators and pollination services is expected to continue, affecting negatively the EU's efforts in halting the loss of biodiversity, securing recovery and implementing the Sustainable Development Goals.

Wildlife, including pollinators, transgress borders and understanding and fixing pollinator declines will require collaboration between scientists across the European Continent. EU regulation, in this case particularly around pesticides, will continue to be influential, and increasingly binding, beyond the borders of the EU27.

Saving pollinators will require EU funding streams, amended acquis and improved implementation of existing regulation. **A full EU Pollinator Strategy** would set out the outcomes, mechanisms, financial costs and societal benefits and would be a vehicle to gain full support of Member States.

Recommended actions

1. Develop a full EU Pollinator Strategy in collaboration with Member States and the Parliament.

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[12] Gallai, N., Salles, J-M., Settele, J. and Vaissière, B.E. 2009. Economic valuation of the vulnerability of world agriculture confronted with pollinator decline. Ecological Economics, 68(3), 810–821.

[13] Garratt, M.P.D., Breeze, T.D., Jenner, N., Polce, C., Biesmeijer, J.C., Potts, S.G. (2014) Avoiding a bad apple: insect pollination enhances fruit quality and economic value. Agric. Ecosyst. Environ. 184, 34–40

[14] Hokkanen, H., Menzler-Hokkanen, I. and Keva, M. (2017) Long-term yield trends of insect-pollinated crops vary regionally and are linked to neonicotinoid use, landscape complexity, and availability of pollinators. Arthropod-Plant Interactions 11:449–461

[15] Garibaldi, L.A., et al. (2013) Wild pollinators enhance fruit set of crops regardless of honey bee abundance. Science, 339, 1608-1611.

Halting and reversing pollinator declines - outcomes and required policy changes

Wildflower rich landscapes restored and reconnected

Wildflower rich landscapes and the vibrant populations of bees and other wildlife that they support are fantastic for people – our lives, and our descendants' lives, will be richer if there are more such places in the countryside.

Agricultural intensification in our countryside, in conjunction with loss of land to urban development, has resulted in a decline of wildflower-rich habitats. Over the last century, more than 90% of semi-natural grasslands have been lost in most European countries owing to intensification or abandonment, and populations of a large number of grassland species have declined or become extinct[16]. Monitoring by EU Member States in accordance with the EU Habitats Directive has shown that grassland ecosystems dependent on agriculture are one of the most threatened habitats and in the poorest conservation status. Almost half (49%) of the grassland habitats assessed under the Habitats Directive are in 'unfavourable-bad' condition[17].

Increasing the availability and sustainable management of plants which provide egg-laying sites and food for larvae is also essential. Not only do flower rich meadows and similar habitats provide the diversity of nectar, pollen, food-plants and nesting sites needed by different pollinators through the seasons, a diversity of flowers enables pollinators to self medicate and maintain health [18] [19]. Hedges and scrub can also be important habitats for pollinators, their management, should be commensurate with maintaining high levels of blossom.

Inappropriate management regimes, such as hedge flailing or mowing at unsuitable times (often too early), kill the larval life stages of some pollinators, preventing their reproduction.

Abandonment of semi-natural grasslands, allowing them to be dominated by rank vegetation, rather than becoming herb rich, is another important driver of pollinator declines.

Conversion of uncultivated or semi-natural grassland, which are often the most flower-rich, into arable or intensive grassland theoretically requires an Environmental Impact Assessment.

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[16] Gustavsson, E., Dahlström, A., Emanuelsson, M., Wissman, J. and Lennartsson T. (2011) 'Combining historical and ecological knowledge to optimise biodiversity conservation in semi-natural grassland', In: Pujol, J.L. (ed.), The importance of biological interactions in the study of biodiversity, InTech.

[17] EEA (2015) State of nature in the EU. Results from reporting under the nature directives 2007–2012. EEA Technical report No 2/2015. ISSN 1725-2237

[18] Baracchi, D., Brown, M. J. & Chittka, L. (2015) Behavioural evidence for self-medication in bumblebees? F1000Research 4.

[19] Palmer-Young, E. C., Sadd, B. M., Irwin, R. E. & Adler, L. S. (2017) Synergistic effects of floral phytochemicals against a bumble bee parasite. Ecol. Evol. 7, 1836–1849.

Unfortunately this is not always applied, and, even when it is, loopholes often allow the destruction of small meadows and/or meadows that are not absolutely pristinely natural[20].

Conversely the encouragement and facilitation of extensive grazing by wild herbivores, particularly when numbers are kept in check by their predators, could bring back the ecological processes that create flower-rich grasslands, managing abandonment and mitigating loss.

The creation and restoration of high-quality, sustainable and diverse habitats, using natural seeding techniques, helps to optimise the conservation of both native wild plants and their pollinators. Natural regeneration from the seed bank, the use of local green hay or colonisation from plants in adjacent areas, are the most effective and ecologically robust methods for improving plant genetic diversity and resilience, bringing long-term benefits to pollinators and the whole ecosystem.

Agri-environmental measures have not been implemented at a sufficient scale across Europe to compensate for the losses of good pollinator habitats and declines in habitat quality. A much greater area of semi-natural/high nature value grassland in good condition is needed to start reversing these declines. Agri-environment measures, landscape scale approaches and initiatives to establish connectivity (structural and functional) and improve the conservation status of N2K sites and species are needed. Much of the action that has been taken so far has been small scale, diffused across the countryside and not targeted in a structured or cost effective manner. Often there is a lack of independent, professional ecological advice available to land managers to assist with the delivery of biodiversity results. Incentives to farmers for sustainable management of grasslands are inadequate and not competitive with support for alternative practices that can be damaging to biodiversity.

Moreover, greening of CAP payments has not been effective: the level of requirement is too weak (they match business-as-usual practices) and too many derogations have been granted - 76% of the farmers in 2015[21].

Climate change has been implicated as a main driver for bumblebee[22 23], butterfly [24 25]and moth declines[26] and is probably driving similar declines in other pollinator groups. Many areas of wildflower-rich habitat now exist as small patches isolated from each other by large expanses of less wildlife-friendly land. This fragmentation leaves populations of insect pollinators marooned and unable to move in response to land-use or environmental change. Creating a more connected

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[20] Goldthorpe, C. (2016) Semi-natural grassland decline: the failings of environmental impact assessment in England. Environmental Law & Management, 26.

[21] European Court of Auditors (2017) Greening: a more complex income support scheme, not yet environmentally effective. Special Report n° 21.

[22] Kerr, J.T., et al.. (2015) Climate change impacts on bumblebees converge across continents. Science, 349, 177–180.

[23] Rasmont P., et. al. (2015). Climate Risk and Distribution Atlas of European Bumblebees. Biorisk 10: 1-236.

[24] Devictor V, et al. (2012). Differences in the climatic debts of birds and butterflies at a continental scale. Nature Climate Change, 2: 121-124. doi:10.1038/nclimate1347.

[25] Settele J, el al. (2008). Climatic Risk Atlas of European Butterflies. BioRisk 1: 1-710.

[26] Fox, R, Oliver, TH, Harrower, C, Parsons, MS, Thomas, CD & Roy, DB (2014) Long-term changes to the frequency of occurrence of British moths are consistent with opposing and synergistic effects of climate and land-use changes. Journal of Applied Ecology, vol 51, no. 4, pp. 949-957. DOI: 10.1111/1365-2664.12256

mosaic of wildflower-rich habitat, with nodes, throughout the countryside through which pollinators can effectively disperse, enabling populations to spread north, is the only feasible climate change adaptation strategy to address associated pollinator declines.

A network of corridors can be mapped at a local level, joining existing and proposed wildlife rich areas, and extending across the EU. When 10% of a line is wildflower rich it will be enabling pollinators and other wildlife to thrive and disperse. This is the most cost effective approach to restoring grassland biodiversity and engaging local communities in agricultural improvement, achieving the same benefit to dispersal without a targeted network approach would be five times as expensive[27]. 'BeeLines' were recently announced as a key component of the Dutch Pollinator Action Plan[28], while 'B-Lines' have already been mapped for much of the United Kingdom.

Article 10 of the Habitats Directive states that:

> "Member States shall endeavour, where they consider it necessary, in their land-use planning and development policies and, in particular, with a view to improving the ecological coherence of the Natura 2000 network, to encourage the management of features of the landscape which are of major importance for wild fauna and flora.
>
> Such features are those which, by virtue of their linear and continuous structure (such as rivers with their banks or the traditional systems for marking field boundaries) or their function as stepping stones (such as ponds or small woods), are essential for the migration, dispersal and genetic exchange of wild species."

A network of managed and restored wildflower habitat would, for a large proportion of European species, address the finding of the 'Evaluation Study to support the Fitness Check of the Birds and Habitats Directives' (March 2016) "there is little evidence that Member States are taking additional measures to implement Articles 3 and 10 of the Habitats Directive, even though they appear to be necessary."[29]

Outcomes

1. Remaining areas of wild flowers, semi -natural meadows and existing High Nature Value agriculture maintained, supported and promoted.
2. B-Lines/BeeLines enabling pollinators and other wildlife to disperse effectively and providing the conditions for populations to recover.
3. Agri-environment schemes successfully deliver habitat for priority pollinator species.
4. Pollinator species and habitats listed in the Habitats Directive in FCS.
5. Transport infrastructure provides net benefit to pollinators.

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[27] Hodgson, J. A., Thomas, C. D., Cinderby, S., Cambridge, H., Evans, P., & Hill, J. K. (2011). Habitat re-creation strategies for promoting adaptation of species to climate change. Conservation letters, 4(4), 289-297. DOI: 10.1111/j.1755-263X.2011.00177.x

[28] Netherlands Government (2018) NL Pollinator Strategy "Bed & Breakfast for Bees" Ministry of Agriculture, Nature and Food Quality, The Hague

[29] Milieu, IEEP and ICF (2016) Evaluation Study to support the Fitness Check of the Birds and Habitats Directives. European Commission, Brussels.

Recommended actions

1. **Allocate at least 30% of CAP Pillar 1 monies to targeted measures to deliver biodiversity outcomes , including:**
    a. Securing safeguarding and positive management of remaining HNV grassland and restoration of sufficient areas of wildflower grassland to reconnect them;
    b. Designate more areas of permanent grassland as Environmentally Sensitive (both inside and outside the N2K network) as envisaged in current architecture of the CAP;
    c. EU wide BeeLine/B-Line network mapped in association with Member States and targeted for habitat restoration activity;
    d. Increase ecological focus area threshold from 5% to 8% of arable land;
    e. Ensure measures support organic agriculture;
    f. Introduce independent, ecologically knowledgeable Farm Advisory Services and make them widely accessible;
    g. Monitoring of the quality of results and availability of advice to land managers undertaken by MS and reported to EC;
    h. Establish fora to help farmers to share and communicate knowledge about reducing pesticide and fertiliser inputs and pollinator friendly farming;
    i. Create legally and financially enabling conditions to encourage the restoration of extensive grazing and associated ecological processes to large areas of land.
2. Implement the EIA Directive more effectively in relation to protecting unimproved grassland, including lowering area thresholds to encompass small meadows.
3. Review of grassland component of Natura 2000 network to establish sufficiency for pollinator conservation, new site designations required where deficiencies identified at MS level, with key pollinators treated as 'typical species'.
4. Focussed effort, with targets and milestones, on ensuring that pollinator species and habitats listed in the Habitats Directive are in FCS, supported by LIFE funding.
5. Road and rail verges managed for pollinators and wildlife bridges routinely incorporated into networks.
6. The EU Grassland Butterfly Indicator to be used as an evaluator at EU, national and regional levels for biodiversity friendly agriculture.
7. Integrate pollinator ecosystems management in education and training programs, especially for farmers, agriculture engineers, landscapers and city planners.

Reduced harm to pollinators from pesticides and other pollutants

While loss of wildflower grassland has historically been the majour factor driving pollinator declines, in the last 20 years the use of broad spectrum insecticides has become the biggest driver. The widespread use of neonicotinoid insecticides has seriously harmed populations of wild bees[30] and probably butterflies and other pollinators as well. There are concerns that pyrethroids may also be

[30] Woodcock, B. A. et al. (2016) Impacts of neonicotinoid use on long-term population changes in wild bees in England. Nat. Commun. 7:12459 doi: 10.1038/ncomms12459

harming populations of wild pollinators, and even organochlorides such as DDT are still present in the environment[31] [32] [33]and honey[34].

While insecticides are the most obvious pesticide directly affecting pollinators, herbicides reduce the landscape availability of pollen and nectar, fungicides have recently been implicated in bumblebee declines[35] and synergistic effects that magnify insecticide toxicity are also well documented[36] [37].

Currently there are over four hundred active substances approved for use as pesticides in the EU. Since the approval process started in 1991, over a hundred have been banned due to their subsequent detrimental effect on the environment or human health. This indicates that the current testing procedure for approval is inadequate, notably demonstrated by the recent partial neonicotinoid ban (which was also itself inadequate to prevent harm as confirmed by the Commission's proposal to extend the ban to all outdoor crops, a move which is supported by the evidence review recently published by EFSA)[38].

There are numerous issues surrounding the testing procedure:

- the EFSA bee guidance[39] is not being routinely applied to EU pesticide approval decisions, resulting in the unacceptable situation where high risk chemicals, such as the neonicotinoids sulfoxaflor and flupyradifurone, are being approved at an EU level without bee safety data;
- higher level field studies are only undertaken on honeybees, that do not reflect the sensitivity levels of other non-target organisms (e.g. wild bees, butterflies, moths and hoverflies), indeed the OECD has now produced additional test methods for bumblebees and chronic risk to honeybees that have not been incorporated into the EU processes;
- acute toxicity tests only take place on around seven sentinel species (one pollinator);
- tests are aimed at detecting direct fatalities, current and future plant protection products are likely to have ecosystem level and/or long-term reproductive effects that will not be assessed with the current tests;

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[31] U.S. Department of Health and Human Services (2002) Toxicological profile for DDT, DDE, and DDD. Agency for Toxic Substances and Disease Registry.

[32] Roos AM, Ba¨cklin B-MVM, Helander BO, Rige´t FF, Eriksson UC (2012) Improved reproductive success in otters (Lutra lutra), grey seals (Halichoerus grypus) and sea eagles (Haliaeetus albicilla) from Sweden in relation to concentrations of organochlorine contaminants. Environ Pollut. 170:268-75. doi: 10.1016/j.envpol.2012.07.017.

[33] Gómez-Ramírez, P., et al. C. (2014) An overview of existing raptor contaminant monitoring activities in Europe. Environ. Int. 67, 12–21.

[34] Wilczynska, A., Przybylowski, P. (2007) Residues of Organochlorine Pesticides in Polish Honeys. APIACTA 42 pp. 16 - 24

[35] McArt SH, Urbanowicz C, McCoshum S, Irwin RE, Adler LS. (2017) Landscape predictors of pathogen prevalence and range contractions in US bumblebees. Proc. R. Soc. B 284: 20172181. http://dx.doi.org/10.1098/rspb.2017.2181

[36] Schmuck R, Stadler T, Schmidt HW. (2003) Field relevance of a synergistic effect observed in the laboratory between an EBI fungicide and a chloronicotinyl insecticide in the honeybee (Apis mellifera L, Hymenoptera) Pest Manag Sci.;59:279–286

[37] Sgolastra, F., et al., (2016) Synergistic Mortality Between a Neonicotinoid Insecticide and an Ergosterol-biosynthesis-inhibiting Fungicide in Three Bee Species. Pest Manag. Sci., 10.1002/ps.

[38] EFSA (2018) Neonicotinoids: risks to bees confirmed https://www.efsa.europa.eu/en/press/news/180228

[39] European Food Safety Authority (2013) EFSA Guidance Document on the risk assessment of plant protection products on bees (Apis mellifera, Bombus spp. and solitary bees). EFSA Journal 2013;11(7):3295, 268 pp., doi:10.2903/j.efsa.2013.3295

- the 'cocktail effect' of pesticides in combination with each other is not taken into account;
- independent studies that show detrimental effects are not addressed quickly enough after the chemical has been approved;
- when environmental impacts of pesticides are called into question there is too much emphasis on proving harm, rather than the onus being on the chemical companies to prove that they are safe, this offends both the precautionary and polluter pays principles;
- pre-approval studies are often wrapped up in commercial secrecy that does not allow for independent analysis; and
- regulatory studies do not use tests of statistical significance, so are not scientifically robust.

Even in the case where restrictions are finally adopted at EU level, Member States grant unjustified "emergency" derogations, which means that in practice bees are still exposed to harmful pesticides[40].

The patent system currently encourages the development of broad spectrum pesticides which maximise sales over a short period of time. Short-termism acts against good environmental and resistance stewardship and encourages secrecy of environmental and efficacy data.

The sale of pesticides to farmers is often commission based, with the middleman getting paid by the pesticide company on the basis of the volume of pesticide sold. Such systems of financial reward introduce a strong bias against the interests of the customer, and in the case of agritoxins against the environment and the public as well. Commission based selling is not allowed in other industries where a close relationship exists between the advisor and individual (e.g. medicines and financial products). This problem has been recognised by President Macron who has vowed to break the link[41].

In addition to a more robust regulatory system there is an urgent need to address the overuse of pesticides[42]. The Sustainable Use Directive (SUD) sets out an ambition to reduce pesticide use and increase take up of Integrated Pest Management (IPM) but many member states (MS) are failing to do this and the Commission needs to take action to ensure compliance with the SUD. The Commission must make it clear to MS that measures to promote IPM need to be line with Article 14 of the SUD which states that:

> "Member States shall take all necessary measures to promote low pesticide-input pest management, giving wherever possible priority to non-chemical methods, so that professional users of pesticides switch to practices and products with the lowest risk to human health and the environment among those available for the same pest problem."

[40] Doyle, D., Buonsante, V., Dermine, M., Panella, F., Dobrescu, C. (2017) Bee emergency call. Pesticides Action Network Europe, ClientEarth, European Bee Keeping Coordination, Romapis.
[41] EU pesticide debate needs more "independent expertise" – Macron
[42] Milner, A.M. and Boyd, I.L. (2017) Toward pesticidovigilance. Science 22 Sep 2017: Vol. 357, Issue 6357, pp. 1232-1234

Good practice can be shared among MS, for instance France and Denmark both have ambitious pesticide reduction targets and Italy has pioneered approaches to soil insecticide use and IPM [43] [44] [45].

In Italy, the adoption of Mutual Funds insurance (covering risk from IPM implementation) was effective in reducing the use of pesticides without negative impact on average yields[46]. This allowed not only to avoid negative environmental impacts, but also to increase farmer profits[47]. The approach developed in Italy could easily be replicated in many other European regions.

Transparency on the actual use of pesticides in the EU is also needed. The Pesticides Regulation[48] imposes precise record-keeping obligations on professional users for the pesticides they use, including the name of the products, the time and the dose of application as well as the area and the crop where the pesticides are used. These records need to be published so that citizens, including beekeepers, can track where, when and in what quantity each pesticide is used.

Cities, boroughs and local authorities often have very significant nursery, planting and land maintenance operations. Local authorities can use significant volumes of pesticides, but this is not necessary, for instance Paris is now "pesticide free".

The sale of banned pesticides by Western companies to countries outside the EU with less rigorous, or in 35% of countries no, pesticide regulation has been described by the UN Human Rights Council as a clear human rights abuse. It is also a clear abuse of the planet's pollinator services. The UN OHCHR has proposed a global convention to bring pesticides under control[49].

Pollinators rely on small quantities of volatile chemicals released by flowers to find flowers and forage effectively. Combustion engine fumes, particularly NOx and resulting ozone, quickly destroy a number of the chemicals released by flowers[50], disrupting both plant-insect and plant-plant communication[51] [52], and reducing pollinator foraging efficiency[53]. For ozone this impact has been shown to occur at levels of 80 and 60 ppb[53], well below the EU permitted level of 120 ppb.

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[43] Furlan L (2014) IPM thresholds for Agriotes wireworm species in maize in southern Europe. J Pest Sci. 87:609–617.

[44] Furlan, L., Contiero, B., Chiarini, F., Colauzzi, M., Sartori, E., Benevegnù, I., Giandon, P. (2017) Risk assessment of maize damage by wireworms (Coleoptera: Elateridae) as the first step in implementing IPM and in reducing the environmental impact of soil insecticides. Environ Sci Pollut Res. 24:236–251.

[45] Furlan L, et al. (2016) Risk assessment of soil-pest damage to grain maize in Europe within the framework of integrated pest management. Crop Prot 97:52–59.

[46] Furlan, L,. Contiero, B,. Sartori, E,. Fracasso, F,. Sartori, A., Vasileiadis, V.P., Sattin, M. (2015) Mutual funds are a key tool for IPM implementation: a case study of soil insecticides in maize shows the way. IPM Innovation in Europe, Poznan 14–16 January, Abstract book, 159.

[47] ASNACODI (2017) Mutual Fund – Pest Integrated management. Presentation to EU Agricultural Outlook Conference.

[48] Regulation (EC) No 1107/2009, Article 67

[49] UN Human Rights Council (2017) Report of the Special Rapporteur on the right to food. UN, New York.

[50] Girling, R.D., Lusebrink, I., Farthing, E., Newman, T.A. & Poppy, G.M. (2013) Diesel Exhaust Rapidly Degrades Floral Odours Used by Honeybees. Sci. Rep. 3, 2779; DOI:10.1038/srep02779.

[51] Farré-Armengol, G., Peñuelas, J., Li, T., Yli-Pirilä, P., Filella, I., Llusia, J. and Blande, J. D. (2016) Ozone degrades floral scent and reduces pollinator attraction to flowers. New Phytol, 209: 152–160. doi:10.1111/nph.13620

Nitrogen fertilisers and atmospheric nitrogen deposition are increasing nutrient levels in many wildlife habitats, encouraging the dominance of grasses and common nutrient loving plants at the expense of flower rich diverse habitats[54] and the bare ground on which many pollinators depend for nesting or thermoregulation[55].

Antihelminthic medicines (biocides) used for de-worming livestock are often persistent and are known to impact larvae of dung feeding beetles and flies[56], and can reduce the decomposition rates of dung, affecting grassland ecology and productivity[57]. Their effects on other pollinators that frequently collect water and mineral salts from dung, on soil fauna, and on wildflower abundance should be fully evaluated and impacts addressed.

Outcomes

1. EU pesticide approval process and subsequent risk management ensures pollinator safety.
2. Significantly reduced pesticide use on farmland.
3. Advice to farmers less heavily biased towards pesticide solutions.
4. Pesticide-free Local Authorities.
5. Pollinator populations not diminished by biocides in livestock dung.
6. A Global Convention on Pesticides that brings uniformity to transparency, approval and pollinator safety.
7. Plant atmospheric semiochemical communication functioning unhindered by air pollution and pollinators able to find flowers easily.
8. Eutrophication of pollinator habitats significantly reduced.

Recommended actions

1. EFSA Guidance on bee risk assessment adopted immediately and applied routinely at EU level.
2. EFSA must ensure that the risk assessments for pesticides authorised since 2013 are promptly concluded by 2020, and, where in relation to the Bee Guidance Tests the pesticides fail or there is insufficient information provided, EU authorisations must be rescinded.
3. EU pesticide approval 'test method' for pollinators reviewed, confirmed and applied as routine, including toxicity and risk assessment for a wider range of pollinator species and assessment of long-term chronic toxicity effects for different life stages.

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[52] Fuentes, J.D., Roulston, T., Zenker, J. (2013) Ozone impedes the ability of a herbivore to find its host. Environ. Res. Lett. 8 014048

[53] Fuentes, J.D., Chamecki, M., Roulston, T., Chen, B., Pratt, K.R. (2016) Air pollutants degrade floral scents and increase insect foraging times. Atmospheric Environment doi: 10.1016/ j.atmosenv.2016.07.002

[54] Wallisdevries, M.F., Van Swaay, C.A. & Plate, C.L. (2012) Changes in nectar supply: A possible cause of widespread butterfly decline. Current Zoology, 58, 384–391.

[55] WallisDeVries, M. F. and Van Swaay, C. A. M. (2006). Global warming and excess nitrogen may induce butterfly decline by microclimatic cooling. Global Change Biology 12: 1620– 1626

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4. Current partial ban on three neonicotinoids extended to all crops and greenhouse use.
5. Consideration given to EU approval process for pesticides being adapted to only approve very limited total volumes of insecticide in any year.
6. Transparency on the actual use of pesticides in the EU in place and on-line.
7. The Sustainable Use Directive further developed, and implemented effectively making sure that all Member States set serious quantitative dependency reduction targets, time tables and measures.
8. Integrated Pest Management must now be implemented effectively with IPM principles being made mandatory.
9. The potential for establishing an EU Mutual Fund insurance scheme to underpin IPM risks considered, or MS to develop appropriate regulatory framework to facilitate their establishment.
10. Pass new regulation to break link between farm advice and income from pesticide sales.
11. Local Authorities supported in becoming completely pesticide free.
12. The EU provides leadership in sponsoring and supporting the development of a Global Convention on Pesticides.
13. Protection of plant atmospheric semiochemical communication incorporated into permittable levels for air pollutants, including reducing the current limit for ozone to a safe level, and in any case below 60 ppb.
14. Reductions achieved in nitrate use on farmland, using extensions to Nitrate Vulnerable Zones to incorporate pollinator habitat if necessary.
15. Nitrate emissions to the atmosphere reduced by the rapid reduction of fossil fuel burning.

Declines in rare and threatened pollinator species reversed

Resilient ecosystems are rich in species and the future value of a pollinator species may be much greater than we can predict now. It makes sense to halt declines now so that extinctions are prevented.

Despite there being hundreds of pollinator species threatened with extinction in the EU there are, at most, only 56 pollinator species provided with protection by the Habitats Directive, most are butterflies with some moths and beetles, but not a single bee, wasp or fly. Most listed pollinators are unfavourable and declining.

The IUCN claims that many rare and scarce bee species are only found within Natura 2000 sites and at least 40% of threatened species of bee are found on at least one Natura 2000 site[7]. Many species have been lost from the wider landscapes, so protected areas provide an essential tool in conservation even if these sites were not designated based on the presence of particular pollinator species.

While the Natura 2000 network (see above) contributes to the conservation of many species, there are many pollinators outside these areas that require conservation action.

Outcomes

1. Rare and threatened pollinator species, particularly those on the EU red lists, recovering and no longer going extinct.
2. Clarity for all sectors on the measures needed to tackle extinction risk to pollinators.
3. EU Red-listing exercise completed for pollinators.
4. Conservation of rare and threatened pollinator species adequately funded.

Recommended actions

1. Efforts to conserve rare and threatened pollinator species, particularly those on the EU red lists, a clear priority for Governments at all levels.
2. EU species action plans drawn up for a range of threatened and endangered pollinator species.
3. Natura 2000 site management plans amended incorporate the needs of threatened pollinators, and species treated as 'typical species' in monitoring and reporting habitat conservation status.
4. EU Red-listing exercises completed for as yet unassessed groups of pollinators.
5. New funding made available to conserve rare and threatened pollinator species.

Valued pollinator services

The economic value of pollinators needs to be recognised by decision makers and their incorporation into natural capital accounting may help to protect services. However it is essential to recognise that the monetary value that pollinators bring to agriculture is not even the only economic reason to value them. Pollinators play a vital role supporting biodiversity and contributing to our own wellbeing by pollinating the wildflowers and garden plants that we enjoy – time spent in natural spaces and gardens is known to be good for our mental health. Even in terms of food security alone we need to be careful about taking a short term approach based on current monetary value alone. Research by the University of Reading in the UK shows that we have the ability to identify a handful of bee species that currently contribute the highest economic returns in terms of providing pollination services to crops; but in a changing climate we may need completely different bee species to pollinate our crops in the future[58]. There is also a need to improve methods to evaluate the economic impact of changes in pollination services [59].

While valuation of services is an important step, taken alone it is not a robust solution to wild pollinator conservation[60]. The importance of conserving a full, healthy and resilient pollinator ecosystem must be tantamount and must not be undermined.

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[59] Liss, K. N., et. al. (2013), Variability in ecosystem service measurement: a pollination service case study. Frontiers in Ecology and the Environment, 11: 414-422. doi:10.1890/120189

[60] Kleijn, D., et al. l. (2015) Delivery of crop pollination services is an insufficient argument for wild pollinator conservation. Nature Communications, 6. 7414.

Authorities rarely consider pollinators and pollination services in EIAs and SEAs, yet this can be the only process available for considering cumulative effects on pollinators and pollination services.

Corporations whose business model is threatened by declining pollinators, or whose business model threatens pollinators, should be required to account for these risks and effects and encouraged to take action to address them.

Outcomes

1. All member states implementing pollinator action plans.
2. Valuation of pollination services incorporated into agricultural strategies and impact assessment.
3. Corporate reporting includes pollinator risks and threats, stimulating positive action from companies and shareholders.

Recommended actions

1. National governments encouraged and supported in developing and implementing pollinator action plans.
2. Valuation of pollination services undertaken and incorporated into agricultural strategies, using a long term view and recognising the importance of pollinator diversity.
3. Pollinators and pollination services incorporated into EIA and SEA processes.
4. Corporate reporting guidance reviewed with risks and threats to pollinators and risks of pollinator decline to business model included where appropriate – standardised format and audited.
5. Annual EU Pollinator Awards for industry sectors, governments and public.

More pollinators around people

Local authorities, businesses and the public can all take action that will help the recovery of pollinator populations and bring back wildlife into towns and cities.

Urban greenspace can be retained and improved for pollinators. Suitable areas include publicly managed green spaces such as parks, cemeteries, communal ground in residential areas, school grounds, and road verges; privately managed green spaces such as private gardens, golf courses, landscaped areas in business parks, hospitals and company premises; and areas of semi-natural habitat such as brownfield sites, river banks and railway lines.

The inclusion of wildflower-rich green infrastructure such as green (brown) roofs, living walls and rain gardens in development proposals provide stepping stones for pollinator species, allowing them to move and disperse to urban greenspace and the wider landscape.

Quarries and gravel workings can offer major opportunities to boost pollinator levels both in their active phases (by allowing worked out areas to develop flower-rich conditions) and through careful

restoration. Careful planning would enable more pollinator conservation activity on and near mineral extraction sites.

Light pollution is increasing rapidly[61] and has been shown to reduce pollinator health and pollination rates[62].

Pot plants present several risks to pollinators, firstly they can contain peat which is sourced from flower rich wildlife habitats, secondly they usually contain insecticides harmful to bees[63] and thirdly they can be imported with little biosecurity, introducing disease and species such as the Asian hornet that feeds on bees.

Outcomes

1. Local authorities implementing pollinator action plans and delivering pollinator friendly habitats, particularly by managing public open space to provide more nectar, pollen, shelter and nesting areas for pollinators.
2. New developments incorporate pollinator friendly green infrastructure.
3. Sites of high environmental quality for pollinators identified in the local plans, protected from development and managed to ensure that they continue to provide suitable pollinator habitat.
4. Mineral extraction planning and restoration playing a positive role in restoring pollinator populations and biodiversity in general.
5. Individuals, families and businesses doing their bit for pollinators.
6. Light pollution levels reduced.
7. Potted plants and soil no-longer providing an open pathway for invasive species.
8. People able to purchase pot-plants that do not have a heavy footprint on pollinators.

Recommended actions

1. Local authorities develop pollinator action plans.
2. Local and national planning authorities encouraged to expect new developments to incorporate pollinator friendly green infrastructure – industry standards developed.
3. Local and national planning authorities encouraged to ensure that sites of high environmental quality for pollinators are identified in the local plan, protected from development and managed to ensure that they continue to provide suitable pollinator habitat.
4. Local and national planning authorities encouraged and supported in ensuring that mineral extraction planning and restoration plays role in restoring pollinator populations and biodiversity in general.

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[61] Kyba, C. C., et al. (2017). Artificially lit surface of Earth at night increasing in radiance and extent. Science Advances, 3(11), e1701528.

[62] Knop E., Zoller L., Ryser R., Gerpe Ch., Hörler M., Fontaine C. (2017) Artificial light at night as a new threat to pollination. Nature, 02. doi:10.1038/nature23288

[63] Lentola, A, David, A, Abdul-Sada, A, Tapparo, A, Goulson, D and Hill, E M (2017) Ornamental plants on sale to the public are a significant source of pesticide residues with implications for the health of pollinating insects. Environmental Pollution, 228. pp. 297-304.

5. Local and national planning authorities encouraged to manage public open space to provide more nectar, pollen, shelter and nesting areas for pollinators.
6. Individuals, families and businesses supported and encouraged to act for pollinators.
7. Light pollution monitored and targets set for future levels, with EC reporting.
8. Effective biosecurity measures introduced for potted plants and soil before they can be moved significant distances.
9. Public bodies managing green areas encouraged to use local plants, maximising benefits for local pollinators and minimising spread of invasive species.
10. Ecolabel for pot-plants introduced – addressing growing medium, pesticide status, origin and (optionally) suitability for pollinators.
11. Annual EU pollinator day to celebrate all pollinators and provide a focus for activity.

Wild pollinators protected from imported parasites and diseases

Imported bees – honeybees and bumblebees - can spread disease to indigenous bees, causing in some cases catastrophic crashes of their populations - this has happened to wild American bumblebees[64] and several times in domesticated honeybees. Commercial bumblebee importers claim that their stock is disease-free, but a recent published study by the University of Sussex has shown this to be incorrect[65]. Using locally bred, indigenous bees would reduce this problem, as a first step much higher standards of biosecurity on bee imports would ameliorate the risk[66].

Outcomes

1. Human facilitated spread of pollinator diseases minimised.

Recommended actions

1. The cross border transportation or long distance transport of bumblebees and other pollinators for crop pollination strictly regulated, or stopped in favour of the use of locally produced, naturally occurring pollinators.

Improved pollinator monitoring and science

Many key pollinator groups are not well recorded or monitored and identification resources are either unavailable or difficult to use. The design of monitoring schemes is critical to the type and quality of data collected, and the right sort of monitoring will provide sound information for gauging

[64] McArt, S.H., Urbanowicz, C.,. McCoshum, S., Irwin, R.E., Adler, L.S. (2017) Landscape predictors of pathogen prevalence and range contractions in US bumblebees. Proc. R. Soc. B 284: 20172181. http://dx.doi.org/10.1098/rspb.2017.2181

[65] Graystock, P., Yates, K., Evison, S.E.F., Darvill, B., Goulson, D. and Hughes, W.O.H. (2013) The Trojan hives: pollinator pathogens, imported and distributed in bumblebee colonies. J Appl Ecol, 50: 1207–1215. doi:10.1111/1365-2664.12134

[66] Goulson, D., Hughes, W.O.H. (2015) Mitigating the anthropogenic spread of bee parasites to protect wild pollinators. Biol. Conserv. 191, 10–19.

how pollinators are faring, and/or determining what we can do to protect and enhance their populations. The FAO has provided guidance on the development and implementation of national pollinator monitoring schemes[67]. They should have good geographical coverage, utilise standardised and quantifiable collection techniques and have a broad taxonomic coverage of pollinators, including flies, wasps and beetles as well and moths and bees. Volunteer schemes, particularly transects, add valuable data for easily identified groups of pollinators with a small number of species.

Field data on pollinators collected using public money or in compliance with regulations is rarely submitted to public databases.

Pollinator science has been developing in many universities and institutes, but remains under-resourced. A better understanding of pollinator ecology and the causes of decline will enable the early identification of issues and the design and implementation of cost effective remediation measures. This is important for preventing the extinction of individual rare and endangered species as well as achieving sustainable populations of commoner pollinators.

Emerging issues such as the impacts of electromagnetic radiation on pollinators[68] and road mortality[69] are currently not being addressed with funded research.

Some sections of the European Council's "European Strategy for the Conservation of Invertebrates" are particularly relevant to maintaining sufficient knowledge and fostering expertise[70].

Outcomes

1. Pollinator monitoring programmes in place across the EU with data shared and reported.
2. Increased research efforts targeted at understanding pollinator ecology and declines and findings translated into policy messages and practical action on the ground.
3. Insect taxonomy expertise supported and developed.

Recommended actions

1. National and Regional Governments supported in establishing standardised pollinator monitoring programmes – following FAO guidance.
2. Centralised EU pollinator data platform.
3. Requirement that pollinator distribution and abundance data gathered using public money, or gathered in compliance with the Environmental Impact Assessment directive, is submitted to public database.
4. EC support for the coordination of pollinator monitoring data from systematic and volunteer based schemes.

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[67] Berkeley, C.A. LeBuhn, G., Droege, S., Connor, E., Gemmill-Herren, B., and Azzu N. (2016). Protocol to Detect and Monitor Pollinator Communities: Guidance for Practitioners. UN: Food and Agriculture Organization. Rome, Italy.

[68] Lázaro, A.. Chroni, A. Tscheulin, T. Devalez, J. Petanidou, T. Matsoukas, C. (2016) Electromagnetic radiation of mobile telecommunication antennas affects the abundance and composition of wild pollinators. Journal of Insect Conservation 20:315–24.

[69] Baxter-Gilbert, J.H., Riley, J.L., Neufeld, C.J.H. et al. (2015) Road mortality potentially responsible for billions of pollinating insect deaths annually. J Insect Conserv 19: 1029.

[70] Haslett, J. (2006) European Strategy for the Conservation of Invertebrates. European Council Strasbourg.

5. Horizon 2020 funding call targeted at understanding pollinator ecology, declines and solutions.
6. Support and funding for insect taxonomy boosted – EC grants available to establish taxonomy posts with a focus on taxonomic groups and biogeographic regions where the biggest current gaps exist – e.g. Mediterranean flies.
7. EC grants available to create online pollinator identification tools – keys and image identification.
8. EU pollinator DNA barcoding project to produce database of DNA profiles of all pollinators.

5th April 2018

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