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Supplementary material

Contents

Sources of data used for the four landscape drivers.

In this study, we selected sites to contrast as much as possible in four hypothesised landscape drivers of pollinator populations a) honey bee density, b) insecticide loadings, c) floral resources and d) habitat diversity. Below is a description of how these drivers were estimated at the landscape scale, and how they were subsequently validated for use in this study. Datasets were compiled using the UK National Grid at the “tetrad” scale (2 x 2km; 4 x 1km grid cells on OS 1:25000 maps).

a) Managed honey bee density.

The English, Welsh and Scottish Governments sponsor honey bee apiary inspection programmes and collate inspection data in a database known as ‘BeeBase’. Colony assessment data were queried for the years 2001-2010 and the number of bees present in mid-summer for an average colony estimated. The number of adult bees was estimated using the brood and assuming an 87.5% survival across all life stages (Winston 1991). The number of colonies present in each apiary was calculated for three apiary classes: 1) apiary owned by a single amateur beekeeper (39 colonies or less); shared apiary of one or more amateur beekeeper; and 3) apiary owned by a professional beekeeper (40 or more colonies owned). Observations of foraging behaviour were gathered for ten site/season combinations from the published literature (Waddington *et al.* 1994; Beekman & Ratnieks 2000). Foraging observations were grouped into 200 m bins representing different foraging ranges for each site/year combination and a distribution model fitted to the sum of all foraging observations. A Gamma distribution was found to account for the short distance flights and a lognormal distribution for the longer flights. The significance of the lognormal part of the model (compared to the Gamma distribution) was tested using an F-test for nested models (Genstat V15). The final model was used to estimate the proportion of the foraging force likely to be active in radiating 200 m bands up to the maximum foraging distance reported for honey bees (13 km; Eckert, 1933). The honey bee density map was completed by rendering foraging models and apiary sizes for all registered apiaries across England, Wales and Scotland (ArcMap 10.0; Esri 2011).

Honey bee forager density around each apiary was calculated for a set of 200m concentric circular bands out to a distance of 13km. The bands were intersected with each other and the forager densities for intersecting bands were summed to give the expected density of honey bee foragers. These polygons were then intersected with the selected 2km site squares and the total expected number of honey bee foragers calculated by multiplying the densities by the area of the intersected polygons within the selected 2km squares.

Validation: This driver could not be validated. Therefore the initial estimates were used in the study.

b) Insecticide loadings

Insecticide loadings (including the loadings derived from insecticidal properties of fungicides and herbicides) were estimated based on information from the UK Pesticide Usage Survey (PUS; Table S1) and cropping data derived from the 2010 Defra June Agricultural Survey for England and the 2010 IACS (Integrated Administration and Control System) data held by the Welsh and Scottish devolved administrations. As part of the PUS, crop records from the three databases of 109 different crop types were harmonised by creating a list of 36 crop groups. Survey data of pesticide applications were then summarised for each crop group, month of application and region. As surveys across all agricultural sectors are too time consuming to be completed in a single year, surveys of pesticide applications to the 36 crop groups were subdivided into 8 Survey Types, and surveys of the corresponding sectors were carried out between 2007 and 2010 (Table S1).

Table S1: Survey type and year of survey for Pesticide Usage Survey data

Survey Type	Year	Holdings Visited	Percentage Area Visited
Arable	2010	1,187	5%
Bulbs and Flowers	2009	111	34%
Fodder crops and Grassland	2009	1,394	9% of fodder area 2% of grassland area
Hardy Ornamental Nursery Stock	2009	272	12%
Hops	2008	36	50%
Orchards	2008	235	49%
Soft fruit	2010	315	49%
Vegetables	2007	623	29%

The Pesticide Usage Survey data contained individual records of the mass of active ingredient and area of crop to which it has been applied, grouped by crop type, region and month of application. Each of the PUS crop types was also linked to one of the 36 crop groups previously created from the cropping data, and the proportional representation of that crop type within the crop group was calculated. Therefore, for this project, we were able to estimate the area of each crop group grown at each site from the Land Cover Map 2007, and then estimate the amount of each active ingredient applied using regional averages.

Untreated areas of crops were accounted for in two ways. Within the pesticide usage survey, the proportion of the crop that is untreated is recorded. Therefore, the mean application rate for an active ingredient on each crop accounts for non-treated area of that crop. In addition, a list of organic holdings was obtained for England, Wales and Scotland. This was then linked to the spatial data on agricultural field parcels and the organic area of each crop within each tetrad was calculated. It was assumed that the organic area did not receive any pesticide inputs, and the contribution of each crop to the total pesticide loadings for each tetrad are based upon the total area of crop minus the estimated organic area of that crop within the site.

Active ingredient data were standardised to a single common unit by estimating total toxicity of the sites using data available for *Apis mellifera*. We recognise that different insect groups may respond differently to active ingredients, but data for *Apis* species are available for the widest range of crops and products. Furthermore, preliminary analysis comparing toxicity between *Apis* and non-*Apis* bee species showed a strong positive correlation suggesting that *Apis* based toxicity is likely to be representative of the relative hazard for other pollinators. Toxicity data for *A. mellifera* came from two sources; the Pesticide Properties DataBase (PPDB; University of Hertfordshire 2013) and Agritox (www.dive.afssa.fr/agritox/index.php; viewed 15/10/12). The PPDB records are primarily sourced from EFSA (European Food Safety Authority) reports. Agritox sources the majority of its data from applications for chemical authorisation which have been validated by European experts. Where possible, both oral and contact LD_{50} were obtained. The active ingredient in the PUS data was linked to the lowest LD_{50} recorded for the compound and this data was used to calculate hazard quotients (eqn. 1) for each PUS record. The hazard quotients were then multiplied by the treated crop area and summed to produce a total hazard score for each PUS crop type and region combination. This was converted to a value representing the hazard per hectare for each crop group by dividing the summed hazard score by the total area of the crop grown in the region, weighting this by the proportional representation that the PUS crop type makes to the crop group, and summing the weighted scores within crop group. The insecticide loading for each of the study sites was then calculated by multiplying the area of each crop group within the site by the hazard score of that crop group in the region in which the site falls.

$$Hazard\ Quotient = \frac{Application\ Rate}{LD_{50}} \qquad \text{[eqn. 1]}$$

Validation: Actual insecticide applications were collated by conducting questionnaires of all landowners and land managers with land within the field sites. The response rate of these questionnaires was approximately 50%, corresponding to an area of approximately 30% of the field sites. It was not possible therefore to "ground truth" the entire metric. Instead, direct comparison between the estimated and actual hazard scores was made for crop areas with detailed field application information provided by the questionnaire returns. The estimated hazard for a field was calculated by applying the regional crop average hazard score per hectare to the area of crop in the field. The actual hazard score for a field was calculated by calculating the hazard score for each application detailed in the questionnaire return and summing these up for the tetrad. The estimated and actual scores were compared on values summarised by tetrad and crop.

c) Floral resource availability

Floral resources in kg of sugar per ha per year was initially derived by combining information from the LCM2007, the National Countryside Survey 2007 (CS2007; Carey *et al.* 2008) and published values of nectar production for 124 species. The first step was to estimate regionally appropriate estimates for the aerial features mapped for each site, using the following equation:

$$F = \sum_{i,j} a_i (c_{j,i} s_j) \quad \text{[eqn. 2]}$$

where a_i is the area in m^2 of the ith habitat type (see Habitat diversity section below), $c_{j,i}$ is the regional average cover of the jth flowering plant species occurring in habitat i taken from the CS2007 and s_j is the sugar potential in kg/ha/year of the jth flowering plant species. F therefore represents the regional mean sugar potential of flowering plants occurring within habitat categories included in the LCM2007 (see Habitat diversity section below). Regionally appropriate plant covers were estimated using all CS "X", "U" and "Y" plot samples. These vegetation plot samples were all 2x2 m in size and are stratified to sample all habitats ("X plots"), unenclosed upland habitats ("U plots") and priority habitats ("Y plots") respectively. They are a stratified random sample of the plant species composition of broad and priority habitats occurring in the random 1x1 km survey squares that are the foundation of the Countryside Survey (Norton *et al.* 2012). Thus estimates of *F* specific to each focal region and habitat class were derived from vegetation plots within those 1x1 km squares coinciding with the focal 100 x 100 km region square and a buffer of 50 km on all sides of the focal region. This equation was further modified to take account of the higher density of "weeds" on organic agricultural land and agri-environment schemes that were not covered by CS2007, and the extraordinary contribution that mass-flowering crops make to the overall floral resource availability of a landscape. The final calculation is therefore represented by:

$$F_T = F + (A_O \times F_A \times 6.26) + (A_{aes-j} \times W_j) + F_{MFC} \qquad \text{[eqn. 3]}$$

where A_o is the area of organic arable land multiplied by the locally appropriate arable resource value F_A but upweighted to reflect the higher weed densities in organic arable fields (calculated from raw data used in Gabriel et al. 2010), $A_{aes\text{-}j}$ is the area of relevant management options in each national agri-environment scheme (Environmental Stewardship in England, Glastir in Wales and Land Manager Options and Rural Priorities schemes in Scotland (from Fera records), weighted by the relative value of each to pollinators as judged by an expert assessment (Breeze *et al.* 2014), and F_{MFC} is the floral resources for mass flowering crops (assessed from Defra June Agricultural Survey data, Defra 2010).

Our goal was to estimate nectar production for a large fraction of Britain's animal-pollinated plants. While there are >2500 spp of plants in the flora (Preston, Pearman & Dines 2002), CS data showed that the commonest 440 species together account for 99% of the total cover, and less than half of these are potentially rewarding to pollinators and are likely to contribute substantially to floral resources on a large scale (Baude *et al.* 2016). Published values of sugar production (*s*) were only available for 124 species at the time of the study site selection (see Table S2 of Gillespie et al. (2017) for a full list). It was therefore necessary to estimate these values for the remaining plants on the list of the most common and most rewarding insect-pollinated British plants. This was achieved through linear modelling (using *R* 2.15.1 (R Core Team 2011)) with published sugar (kg/ha/year) as a response variable and various plant traits as explanatory variables. Plant traits for all species were collated from online databases Biolflor (Klotz, Kuhn & Durka 2002; www.biolflor.de) and EcoFlora (Fitter & Peat 1994); http://www.ecoflora.co.uk/), with supporting information from Crane & Walker (1984), Crane, Walker & Day (1984), Grime *et al.* (1988), Stace (2010) and Crawford (2000). Where information on a trait could not be found in any published sources for a plant, the value was estimated from the scores of other plants in that genus. When most plants within the genus shared the same score or trait, that value was used for the missing plant. When the plants within the genus were widely differing in the trait, the missing plant was given the value of the most similar or closely related species. The database of traits used in modelling can be found in Table S2 of Gillespie et al. (2017).

The linear model was fitted with as many plant trait variables as possible (no interactions) and then a backward selection protocol using AIC to compare models was employed to derive the most important plant traits in explaining sugar production. Due to a limited number of published sugar values, subsequent prediction for all 220 species was problematic because of a lack of representation of all plant trait values. For example, there were no sugar production values for certain plant families meaning that subsequent prediction of sugar production could not be made for missing plant families. Some of the plant trait categories required amalgamation therefore and this was performed ensuring that new categories made biological sense. Important reclassifications are described in Table S2. The final linear model ($F_{11, 91}$=10.24, $p < 0.0001$, R2 = 0.55) had six single terms (Table S3) and was used to make predictions of sugar production (kg/ha/year) for 96 species. The subsequent estimates were then used in eqn. 2.

Table S2: Reclassifications of plant trait categories for inclusion in linear modelling and subsequent predictions.

Plant trait	Description and categories	Category without published sugar values	Reclassified category
Müller class	After Műller (1881), a classification into categories according to depth of nectar display or pollinator groups. Relevant categories: A = open nectar display AB = part hidden nectar source B = totally hidden nectar source H = Hymenoptera pollinated F = Lepidoptera pollinated D = Diptera pollinated Po = pollen is main reward W= wind pollinated O = occasionally insect pollinated	O, W F, D	Po H
Dicliny	Based on the category of Dicliny: the spatial separation of sexes on flowers. Hermaphroditic = all flowers bisexual Monoecious = male and female flowers on same plant Dioecious = male and female on different plant Gynomonoecious = female and bisexual on same plant Gynodioecious = female and bisexual on different plants Andromonoecious = male and bisexual on same plant Androdioecious = male and bisexual on different plants Trioecious = female, male and bisexual on different plants Trimonoecious = female, male and bisexual on same plant	Gynomonoecious, Andromonoecious, Trimonoecious Gynodioecious, Androdioecious, Trioecious Hermaphroditic* Monoecious* Dioecious*	Same Different Same* Different*
Strategy	Ecological strategy following the system of Grime et al. (1988). c – competitors (highly competitive plants) r – ruderals (Usually annual, weedy plant species which produce many seeds and can easily colonize pioneer habitats) s – stress-tolerators (Species with slow relative growth rates and morphological and/or physiological adaptations to conditions of resource scarcity and climatic severity). cr – competitors/ruderals (Intermediate between these two types) cs – competitors/stress-tolerant (Intermediate between these two types) sr – stress-tolerant/ruderals (Intermediate between these two types) csr – competitors/stress-tolerant/ruderals (Intermediate between all three types, usually rosette plants or small, perennial species which can utilize spatio-temporal niches very well and have an intermediate life span)	s sr	Assigned to the closest ecological category for each species

* These categories do have representatives with published values, but were still reclassified as “Same” or “Different” as above to maintain a two-level categorical variable.

Table S3: Analysis of variance table of the final linear model used to predict sugar production (kg/ha/year) using published values as the response variable.

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Müller class*	4	748.4	187.0	18.92	<0.0001
Breeding system†	3	83.7	27.9	2.82	<0.05
log(Maximum Height (mm))	1	126.1	126.1	12.75	<0.001
Same or Different‡	1	73.4	73.4	7.42	<0.01
Corolla Depth (mm)	1	14.5	14.5	1.46	0.229
Mean Bee Index	1	68.6	68.6	6.93	<0.01
Residuals	91	899.9	9.9		

*"Müller class" refers to the Müller classification system of flower shape and in this dataset, there were five classes (pollen (pollen is main reward), open nectaries, partly-hidden nectaries, hidden nectaries, and plants pollinated by specific species groups).
† "Breeding system" is defined by the origin of the gametes and this dataset had five classes (allogamous, facultative allogamous, autogamous, facultative autogamous and mixed mating systems).
‡The "same or different" term refers to relative location of male and female flowers on an individual plant (both sexes were on the "same" plant (including hermaphroditic plants) or the sexes were separated on "different individuals).

Floral resource validation surveys

Validation for this metric required several stages. First, actual floral reward production was sampled for a wide range of species (*s* in eqn. 2). Second, transect surveys were conducted to assess actual floral cover of each species for each habitat within each site (*c* in eqn 2). Finally, using corrected habitat areas from the habitat heterogeneity ground truthing (*a* in eqn 2) and corrected AES, MFC and organic areas, the total floral resource was calculated.

i) *Floral reward production.* The methods for quantifying the amount of nectar produced per flower per day are described by Baude et al. (2016). Briefly, nectar resources (µg of sugars/flower/24h) were quantified for 175 species from the target list (Table S2 in Gillespie et al. 2017). When possible (115 spp.), two populations for each species in two distinct locations and on two distinct dates were surveyed for nectar production. For each species, an average of ten flowers (range 4-20 per population) were bagged for 24 hours to prevent depletion by insects. After this period, nectar was collected between 0900 and 1600 hours using glass microcapillaries (1 and 5µL Minicaps end to end, Hirshmann, Eberstadt, Germany; 76 species) or by rinsing with 1-5 µL of distilled water. Sugar concentration (%; g sucrose/100 g solution) was then measured by a hand held refractometer modified for small volumes (Eclipse, Bellingham and Stanley, Tunbridge Wells, UK). Nectar sugar content produced per flower in 24h (s; µg of sugars/flower/24h) was calculated from the equation:

$$s = 10dvC \qquad \text{[eqn. 4]}$$

where v is the volume collected (µL), and d is the density of a sucrose solution at a concentration C (g sucrose/100 g solution) as measured by the refractometer (Corbet 2000).

As more than 400 species were recorded in the field sites, statistical modelling was again employed to more accurately predict sugar production for the unsampled species. To limit the number of species for which plant traits were needed, only those species found in more than 1.5% of the survey area were modelled. The same linear modelling procedure was followed here as in the site selection protocol above, with the only difference being that all 175 sampled species were used as the response variable (as opposed to 124 species from published sources), and the response variable was sugar (µg) per flower per day (log transformed). The final model ($F_{48, 83} = 7.91$, $p < 0.0001$, $R^2 = 0.82$) consisted of 6 single terms and one interaction and was used to predict sugar values for 61 species in 2012 and 82 species in 2013. The parameters of the second model are presented in Table S4.

Table S4: Analysis of variance table of the final linear model used to predict sugar production (µg per flower per day) using measured or published values as the response variable.

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Family*	18	118.3	6.6	5.59	<0.0001
Biolflor nectar score†	3	149.7	49.9	42.41	<0.0001
Breeding system	4	45.4	11.4	9.65	<0.0001
Flowering time‡	1	3.2	3.2	2.70	0.104
Müller class	5	42.4	8.5	7.21	<0.0001
Strategy$^{\Delta}$	4	28.7	7.2	6.10	0.0002
Breeding system x Strategy	13	58.9	4.5	3.85	<0.0001
Residuals	83	97.6	1.2		

*Family: where a plant family was represented in measured nectar database by 3 species or less, the species was grouped by clade: Asterid, Eudicot or Monocot.

† Biolflor nectar score: a categorical term from www.biolflor.de; a species is scored for the amount of nectar reward it provides: 1 = none, 2 = little, 3 = present, 4 = plenty.

‡ Flowering time is the number of months the species usually spends flowering in temperate conditions. This is assumed to be the last month of flowering – first month of flowering.

Δ Ecological strategy following the system of Grime et al. (1988). See Appendix S3 for class amalgamations

ii) *Flowering plant cover*. The site selection protocol used regional averages of plant species cover per habitat to calculate total nectar resources per site, but to enhance the accuracy of this estimate flower surveys within each field site were conducted. A total of 1100-1200m^2 (1100m – 1200m of transect x 1m width) was surveyed per site on three sampling occasions during each survey season (April to September). Sampling usually required an entire day to complete one site, so each site was surveyed on a different day. Sampling was completed three times during each season: 1) April-May, 2) June-July, 3) August-September to coincide with the three pan trapping rounds (see main text).. The order that the sites were visited was randomised for each sampling round.

1000m^2 of the study site area was proportionately stratified by habitat areas of the site (e.g. a broad habitat class covering 70% of the site would have 700 m^2 of transect). The remainder was assigned to “linear features” of the site (categorised as (1) roadside verges, (2) water feature edges, (3) hedgerows and (4) stone walls and fence lines), with 2 x 20 m^2 of transect allocated to each linear feature type present (Fig. S1). Transects were selected at random by overlaying a 25 m grid on the LCM 2007 map of a site in

ArcMap, and randomly selecting starting points and starting directions using a random number generator. Habitats and linear features occurring within the central 1/9th of the site (666.67 m x 666.67 m) were prioritised for practical purposes. Any habitats or features not occurring within this square were then chosen from the remaining areas of the site. Furthermore, the length of transect was split into sub-transects depending on the total length required for the habitat type. The rules for splitting the transect into sections are summarised in Table S5. Sub-transects were only ever multiples of 10, and the area of habitats was rounded to the nearest integer to enable this. Linear features were always assigned 2 x 20 m^2 of transect, regardless of length or number of such features. In some sites, it was not always possible to find two distinct examples of a linear feature, in which case only a single 20 m^2 transect was included.

Table S5: summary of rules for splitting the transects into sub-transects.

Area of habitat type	Total length of transect	Number of transect sections	Length of sections
<1%	0	0	0
1-5%	10-50 m	1	10-50 m
6-25%	60-250 m	2	30-130 m
26-75%	260-750 m	3	130-250 m
>76%	>760 m	4	190-250 m

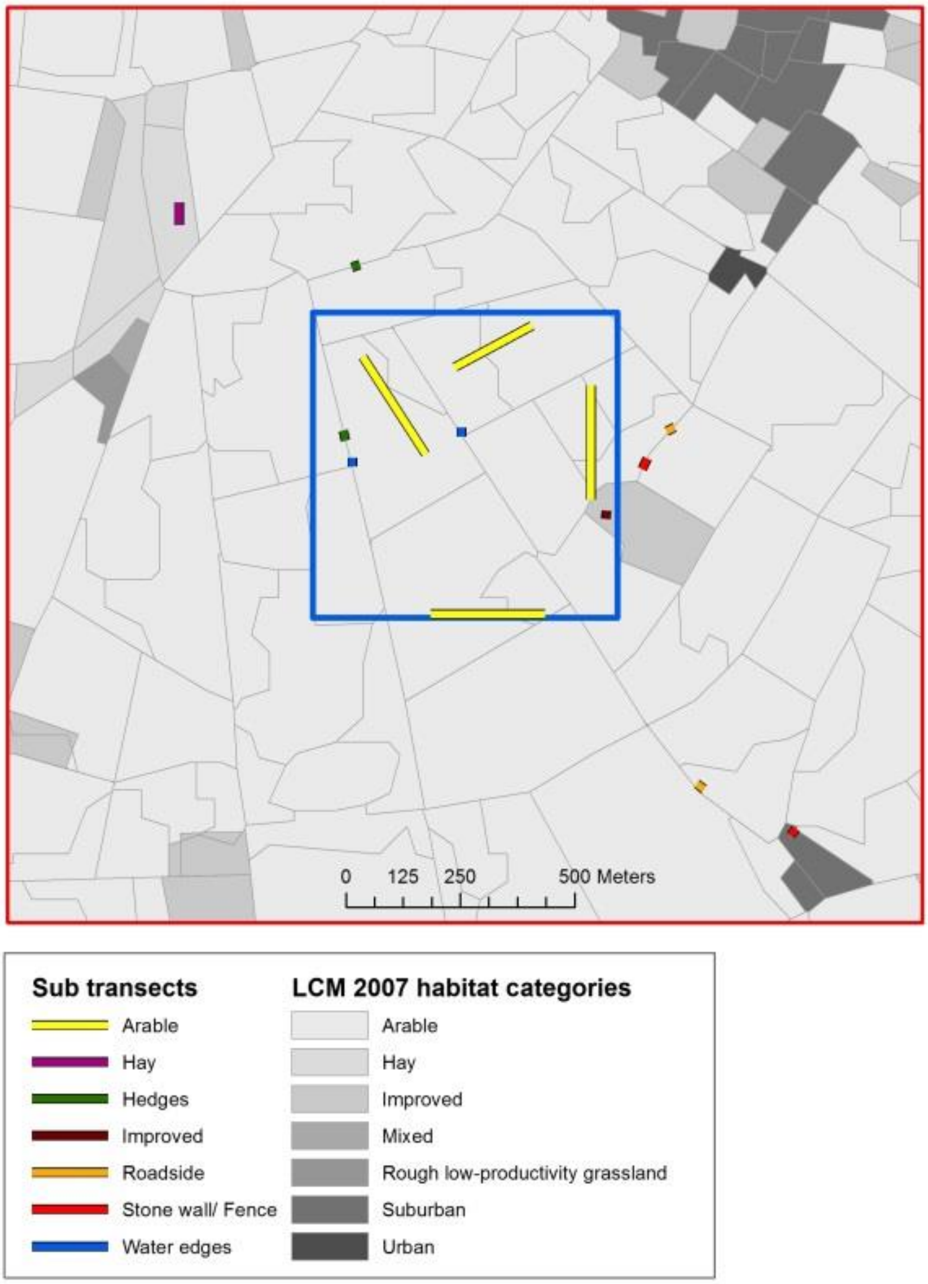

Fig. S1: Example of the allocation of sub-transects to a field site. The majority of the land cover is arable (93.6%). Therefore, 940 m^2 of the total transect should be allocated to this habitat. According to the rules in Table S5, this should result in 4 sub-transects of 230 m each. However, for practical purposes these were adjusted in the field to 3 x 250 m sub-transects and 1 x 190 m. The remaining cover consists of Hay meadow (4.7%; 1 x 50 m sub-transect), Improved grassland (1.3%, 1 x 10 m sub-transect), Rough-low productivity grassland (0.3%; no sub-transect) and Mixed woodland (0.1%; no sub-transect). There are also 2 x 20 m^2 sub-transects for the 4 linear features. Where possible, the sub-transects are placed in the central $1/9^{th}$ of the site (blue square) for practical purposes.

Sub-transect locations were fixed prior to the first field visit, but often there was a need to move them due to access problems or incorrect habitat classification. Where possible the sub-transect was rotated (keeping the same point of origin but directing the transect so as to avoid the obstacle), but where that was not possible a new random location was chosen. Once fixed, the sub-transects were revisited each sampling round. New sub-transect locations were chosen for the second field season in 2013, so as to increase the level of representation of the focal landscape.

Each sub-transect was made up of 10 m sections. Each section consisted of a 1 m wide x 0.5 m quadrat and a 1 m x 9.5 m additional belt. To sample flower abundance, the quadrat was first placed at the beginning of the 10m section, and all "floral units" of each animal-pollinated species were counted (a floral unit being operationally defined as the cluster of flowers over which a honey bee could walk, rather than fly, to reach all nectaries, e.g. capitulum, sub-umbel etc.). Any floral species occurring in the additional belt but not in the quadrat was counted, estimating floral unit counts to a logarithmic scale (i.e., 1, 2, 5, 10, 20, 50, 100…) for practicality. The second quadrat of the sub-transect was then placed at the 10m mark, and the process was repeated until the sub-transect was complete. The number of flowers per floral unit was estimated separately by counting the flowers on three randomly selected floral units outside the transect areas on each survey date.

iii) *Floral resource availability*. The data from point i) and ii) above were combined to derive the total floral resource for each site by adapting eqn. 2 above. First, eqn. 5 calculates the amount of nectar (N) per metre squared for each species and each habitat type:

$$N_{ij} = \left(c_{qj} \times s_i \times 2\right) + \left(c_{aj} \times \frac{s_i}{10}\right) \qquad \text{[eqn. 5]}$$

where c_{qj} is the number of flowers per square metre in all quadrats for habitat *j*, c_{aj} is the number of flowers per square metre in all additional belts for habitat *j*, and s_i is the sugar per flower for species *i* (µg). The nectar in µg per metre squared for each species is then summed for each broad habitat and over the three seasons, and then divided by the area of transect sampled to derive the total nectar per m^2, S_j:

$$S_j = \sum_{j=1} N_j / t_j \qquad \text{[eqn. 6]}$$

Where N_j is the summed nectar from eqn 6 for the jth habitat and t_j is the area of transect sampled in m^2 for the jth habitat. Finally, S_j is multiplied by the area of each habitat and the summed amount provides the total validated floral resource for a site.

$$F_{gt} = \sum_{j=1} S_j \times a_j \qquad \text{[eqn. 7]}$$

where S_j is the total nectar per m^2 for the jth habitat category and a_j is the area in m^2 of the jth habitat category. These figures were then translated to kg sugar per hectare per year.

d) Habitat diversity

Values were derived from the LCM2007. An adapted Shannon diversity index was calculated for each potential site using the following equation:

$$H' = -\sum_{i=1}^{R} p_i \ln p_i \qquad \text{[eqn. 8]}$$

where p_i is the proportion of the area of the site in m^2 belonging to the ith sub-broad habitat category, and R is the number of sub-broad habitat categories. The sub-broad habitat categories of the LCM2007 are listed in Table S6.

Table S6: Descriptions of Broad habitat sub-classes LCM 2007 used to calculate habitat diversity indices and to proportionately allocate transects for the collection of flower data.

Broad Habitat class	Broad Habitat sub-classes	Description
Broadleaved woodland	Deciduous Recent (<10yrs)* Mixed Scrub	Broadleaved woodlands are characterised by stands >5 m high with tree cover >20%; scrub (<5 m) = cover >30%. Recent woodland = plantations created less than 10 years ago.
Coniferous Woodland	Conifer Recent (<10yrs)* Felled	Includes semi-natural stands and plantations, with cover >20%. This includes new plantation and recently felled areas. Recent woodland = plantations created less than 10 years ago.
Arable and Horticulture	Arable Orchard**	Includes annual crops, perennial crops such as berries and orchards and freshly ploughed land.
Improved Grassland	Improved grassland Hay	Improved grassland is distinguished from semi-natural grasslands based on its higher productivity, lack of winter senescence and location and/or context.
Neutral Grassland	Neutral	Neutral Grassland is determined based on botanical composition and it also includes semi-improved grasslands managed for silage, hay or pasture
Calcareous Grassland	Calcareous	The same methods apply as for Neutral Grassland (see above).
Acid Grassland	Acid	The same methods apply to Acid grassland as for Neutral Grassland (see above).
Rough Grassland	Rough / unmanaged grassland	The grass that remains as Rough grassland is a mix of areas of managed, low productivity grassland, plus some areas of semi-natural grassland, which could not be assigned Neutral, Calcareous or Acid grassland with confidence
Fen, Marsh and Swamp	Fen / swamp	Includes fen, fen meadows, rush pasture, swamp, flushes and springs.
Heather Heather grassland	Heather & dwarf shrub Burnt heather Gorse Heather grass	Dwarf Shrub Heath is divided into two classes, depending on the density of Heather, producing Heather and Heather grassland classes respectively. Note, the Broad Habitat classification treats ericaceous vegetation on peat > 0.5 m depth as Bog.
Bog	Bog (Grass dominated) Bog (Heather dominated)	Bog includes ericaceous, herbaceous and mossy swards in areas with a peat depth > 0.5 m. Bog forms part of an ecological continuum covering Acid Grassland, Dwarf Shrub Heath and some types of Fen, Marsh and Swamp and the separation of these habitats can be difficult, as the surface vegetation (i.e. land cover) maybe very similar and the division rests on the depth of peat. The division in the field can account for species presence, plus peat depth.
Inland Rock	Inland rock Montane habitats	Covers both natural and artificial exposed rock surfaces which are >0.25ha, such as inland cliffs, caves, screes and limestone pavements, as well as various forms of excavations and waste tips such as quarries and quarry waste.
Other	Pollen and nectar mix***	Patches of marginal land that have been seeded with pollen and nectar rich flowering plants to support local pollinator populations

*The two Recent (<10 years) categories were combined due to low cover

**Orchards were combined with parts of Arable land included mass-flowering crops to make a new categories called Arable MFC

*** This category does not feature in the LCM but was added following ground truthing of habitat covers

Validation: During the summers of 2012 and 2013, habitat maps of the field sites produced from the LCM2007 were assessed in the field. Habitat classifications of field parcels were compared to reality and corrected where necessary. Corrections were made in ArcMap 10.0 and new area measurements calculated to produce validated Shannon habitat diversity indices. Over the two years, field assistants were about to verify the vast majority of land in the 96 field sites. We did not collect statistics on the proportion of corrections for all sites, but they required a wide range of corrections, from no corrections needed to approximately 50% of the land requiring correction. For parcels of land we were not able to verify, the classification was likely to be relatively accurate: the LCM 2007 was found to have an overall accuracy of 83% (Morten et al. 2011).

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Pollinator collection

Table S7: Dates of the three rounds of pollinator collection for 2012 and 2013 across all 96 sites. The first date for each round marks the first day of suitable weather for pan trapping (clear, warm and calm days), when up to four sites in each region were sampled. Due to the distance between sites, it was only possible to sample four sites at a time. The remaining sites were sampled on other suitable days during the period, and the last date of each round marks the last day of sampling across all 96 sites.

	Round 1	**Round 2**	**Round 3**
2012	1 – 31 May	20 June – 31 July	16 August – 18 September
2013	8 – 31 May	6 June – 12 July	6 August – 11 September

Floral resource diversity

In order to calculate a measure of the diversity of nectar sources, we used the estimated amount of nectar (N) per square metre for each species and each habitat type from equation 5 above. These nectar scores were then multiplied by the area of each habitat type to derive an estimated amount of nectar provided by each species within each habitat. The values were then summed for each species to derive an estimate of the total amount of nectar that each species provides for the site. This resulted in a site x species matrix, with sites as rows, and species as column, but instead of the traditional abundance values in the cells of the matrix, the cells consisted of the estimated amount of nectar in kg that each species provides at the site level. These values were used to calculate the Shannon diversity index of floral resources.

Model coefficients and interaction graphs

Table S8: Coefficients and 95% (Wald) confidence intervals from confirmatory models of abundance of all pollinators and sub-groups. All models were GLMMs with negative binomial distributed errors (quadratic parameterisation). Note that floral resources and insecticides were log transformed, and all explanatory variables were scaled and centred. Figures in bold denote significant terms (CI's do not encompass zero).

	All pollinators		**Bumblebees**		**Solitary bees**		**Hoverflies**	
	Estimate	**95% CI**	**Estimate**	**95% CI**	**Estimate**	**95% CI**	**Estimate**	**95% CI**
Intercept	**4.05**	**2.72, 5.38**	0.50	-1.16, 2.15	**-2.96**	**-5.85, -0.07**	**4.10**	**2.33, 5.87**
Honeybees	0.08	-0.02, 0.18	0.04	-0.08, 0.15	**0.32**	**0.15, 0.50**	0.04	-0.08, 0.16
Insecticides	0.07	-0.12, 0.26	-0.09	-0.32, 0.15	0.03	-0.33, 0.39	0.21	-0.03, 0.45
Floral resources	0.05	-0.05, 0.16	0.11	-0.03, 0.24	0.04	-0.17, 0.25	0.01	-0.12, 0.15
Habitat diversity	-0.02	-0.13, 0.10	-0.01	-0.15, 0.13	-0.03	-0.25, 0.18	-0.01	-0.16, 0.14
Year (2013)	**-0.59**	**-0.74, -0.44**	0.06	-0.15, 0.28	**-0.44**	**-0.74, -0.14**	**-0.70**	**-0.90, -0.49**
No. of trap bowls	0.01	-0.01, 0.04	**0.04**	**0.01, 0.08**	**0.11**	**0.05, 0.17**	0.00	-0.04, 0.04
Honeybees: Insecticides	-0.06	-0.15, 0.04	0.07	-0.05, 0.18	-0.03	-0.20, 0.14	-0.11	-0.24, 0.01
Honeybees: Floral resources	-0.02	-0.11, 0.06	0.05	-0.06, 0.16	-0.05	-0.20, 0.11	-0.06	-0.18, 0.06
Honeybees: Habitat diversity	-0.06	-0.16, 0.04	-0.02	-0.14, 0.10	-0.05	-0.23, 0.13	-0.07	-0.19, 0.06
Insecticides : Floral resources	**-0.10**	**-0.20, -0.01**	-0.07	-0.19, 0.06	-0.06	-0.26, 0.13	-0.10	-0.24, 0.03
Insecticides : Habitat Diversity	-0.07	-0.20, 0.05	-0.11	-0.26, 0.04	-0.04	-0.27, 0.20	-0.04	-0.21, 0.12
Floral resources: Habitat diversity	0.08	-0.01, 0.17	**0.16**	**0.03, 0.28**	-0.01	-0.19, 0.16	0.10	-0.03, 0.22
Site: Region standard deviation	**0.41**	**0.30, 0.54**	**0.42**	**0.29, 0.62**	**0.67**	**0.48, 0.95**	**0.49**	**0.34, 0.71**
Region standard deviation	**0.67**	**0.37, 1.22**	**0.61**	**0.31, 1.18**	**1.24**	**0.66, 2.34**	**0.88**	**0.49, 1.60**

Table S9: Coefficients and 95% (Wald) confidence intervals from confirmatory models of species richness of all pollinators and sub-groups. All models were GLMMs with negative binomial distributed errors (quadratic parameterisation), except bumblebees and hoverflies (Poisson). Note that floral resources and insecticides were log transformed, and all explanatory variables were scaled and centred. Figures in bold denote significant terms (CI's do not encompass zero).

	All pollinators		Bumblebees		Solitary bees		Hoverflies	
	Estimate	**95% CI**	**Estimate**	**95% CI**	**Estimate**	**95% CI**	**Estimate**	**95% CI**
Intercept	**2.07**	**1.35, 2.78**	-0.19	-1.50, 1.12	**-2.50**	**-4.76, -0.24**	**2.07**	**1.33, 2.81**
Honeybees	**0.07**	**0.03, 0.12**	0.02	-0.04, 0.09	**0.23**	**0.12, 0.34**	0.04	-0.01, 0.10
Insecticides	0.00	-0.09, 0.10	-0.01	-0.15, 0.13	-0.06	-0.27, 0.15	0.06	-0.05, 0.17
Floral resources	0.03	-0.03, 0.08	0.07	-0.02, 0.16	-0.03	-0.19, 0.12	0.03	-0.04, 0.09
Habitat diversity	0.00	-0.06, 0.06	0.02	-0.06, 0.10	-0.01	-0.15, 0.13	-0.03	-0.10, 0.04
Year (2013)	**-0.19**	**-0.27, -0.11**	-0.01	-0.16, 0.15	**-0.33**	**-0.51, -0.16**	**-0.17**	**-0.27, -0.08**
No. of trap bowls	**0.02**	**0.01, 0.04**	0.03	0.00, 0.06	**0.08**	**0.03, 0.13**	0.01	-0.01, 0.02
Honeybees: Insecticides	0.00	-0.05, 0.05	0.02	-0.04, 0.09	-0.01	-0.12, 0.09	-0.01	-0.07, 0.05
Honeybees: Floral resources	-0.02	-0.06, 0.02	0.04	-0.04, 0.11	-0.06	-0.14, 0.02	-0.04	-0.10, 0.02
Honeybees: Habitat diversity	-0.03	-0.08, 0.02	0.03	-0.03, 0.10	-0.06	-0.17, 0.05	-0.03	-0.09, 0.03
Insecticides : Floral resources	-0.04	-0.09, 0.01	-0.05	-0.13, 0.04	-0.01	-0.15, 0.12	-0.01	-0.07, 0.05
Insecticides : Habitat Diversity	-0.01	-0.07, 0.05	0.00	-0.09, 0.09	-0.03	-0.18, 0.13	-0.03	-0.11, 0.05
Floral resources: Habitat diversity	0.02	-0.03, 0.07	0.05	-0.03, 0.13	-0.02	-0.13, 0.08	0.04	-0.02, 0.10
Site: Region standard deviation	**0.18**	**0.13, 0.26**	0.00	0.00, Inf	**0.37**	**0.25, 0.55**	**0.22**	**0.16, 0.31**
Region standard deviation	**0.38**	**0.20, 0.70**	**0.23**	**0.10, 0.52**	**1.11**	**0.61, 2.03**	**0.33**	**0.18, 0.61**

Table S10: Coefficients and 95% (Wald) confidence intervals from confirmatory models of diversity (Inverse Simpson index) of all pollinators and sub-groups. All models were GLMMs with Gamma (log link) distributed errors (quadratic parameterisation). Note that floral resources and insecticides were log transformed, and all explanatory variables were scaled and centred. Figures in bold denote significant terms (CI's do not encompass zero).

	All pollinators		**Bumblebees**		**Solitary bees**		**Hoverflies**	
	Estimate	**95% CI**	**Estimate**	**95% CI**	**Estimate**	**95% CI**	**Estimate**	**95% CI**
Intercept	**1.22**	**0.28, 2.16**	0.65	-0.31, 1.60	0.54	-1.42, 2.50	**1.08**	**0.22, 1.93**
Honeybees	**0.08**	**0.03, 0.14**	0.01	-0.04, 0.06	**0.13**	**0.07, 0.20**	0.06	0.00, 0.11
Floral resources	0.00	-0.07, 0.08	0.04	-0.03, 0.10	-0.02	-0.12, 0.08	0.02	-0.05, 0.10
Insecticides	0.02	-0.10, 0.14	0.07	-0.04, 0.17	-0.05	-0.18, 0.08	0.07	-0.06, 0.19
Habitat diversity	0.02	-0.05, 0.08	0.03	-0.03, 0.09	0.00	-0.08, 0.08	-0.01	-0.08, 0.06
Year (2013)	**0.15**	**0.02, 0.28**	-0.07	-0.18, 0.04	-0.02	-0.17, 0.13	0.07	-0.07, 0.20
No. of trap bowls	0.02	-0.01, 0.04	0.01	-0.01, 0.03	0.01	-0.03, 0.05	0.01	-0.01, 0.03
Honeybees: Floral resources	-0.02	-0.08, 0.05	0.00	-0.05, 0.06	-0.04	-0.12, 0.03	-0.02	-0.08, 0.05
Honeybees: Insecticides	0.02	-0.03, 0.08	0.00	-0.05, 0.05	0.03	-0.04, 0.09	0.01	-0.05, 0.07
Honeybees: Habitat diversity	-0.01	-0.06, 0.05	0.03	-0.02, 0.08	-0.07	-0.14, 0.00	0.02	-0.04, 0.08
Insecticides : Floral resources	0.01	-0.06, 0.08	-0.05	-0.11, 0.01	-0.06	-0.15, 0.04	0.03	-0.04, 0.10
Floral resources: Habitat diversity	0.01	-0.06, 0.08	0.02	-0.04, 0.08	-0.01	-0.10, 0.08	0.05	-0.02, 0.12
Insecticides: Habitat diversity	0.01	-0.06, 0.09	0.02	-0.04, 0.09	-0.02	-0.11, 0.06	0.01	-0.07, 0.09
Site: Region standard deviation	0.00	0.00, Inf	**0.09**	**0.01, 0.66**	**0.10**	**0.01, 1.15**	0.00	0.00, Inf
Region standard deviation	**0.38**	**0.20, 0.71**	**0.10**	**0.03, 0.35**	**0.65**	**0.36, 1.19**	**0.09**	**0.02, 0.47**

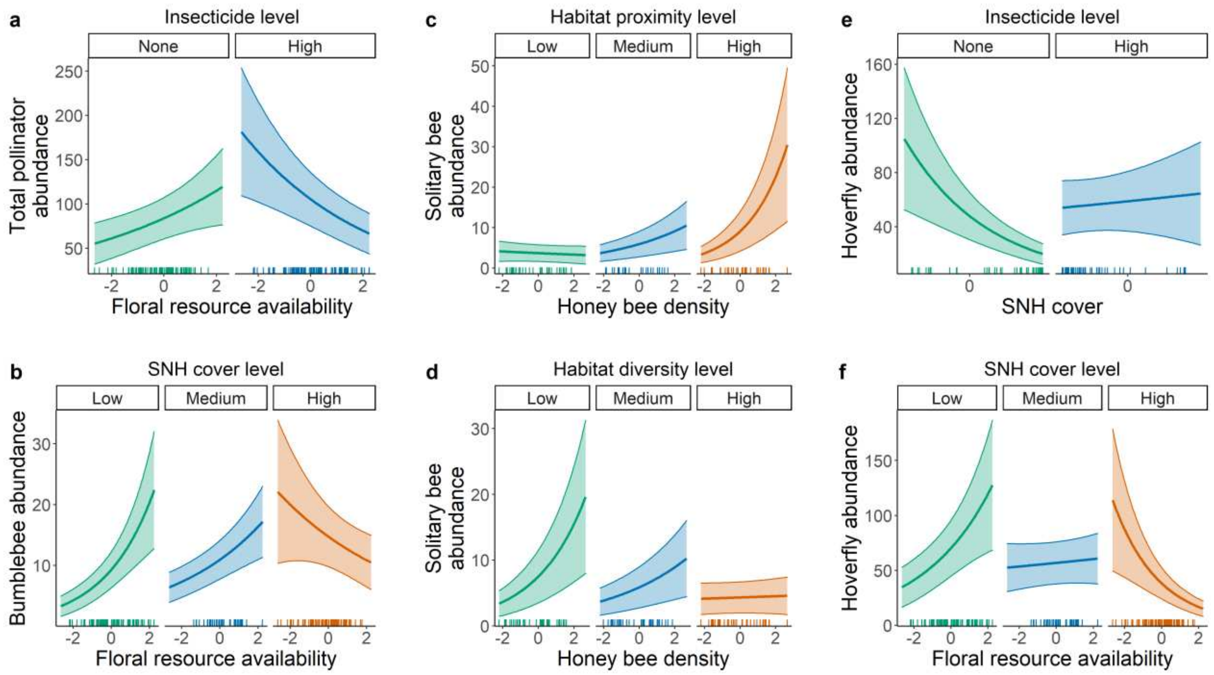

Figure S2**:** Interaction graphs for selected significant interactive effects of landscape drivers on a) the abundance of total insect pollinators, b) bumblebee abundance, c) & d) solitary bee abundance, and e) & f) hoverfly abundance. Interactions shown here are those not included in the main text. For graphs a) and e), the two panels show simple slopes when insecticides are held constant at zero, and when insecticides are "high" (median insecticides for sites with non-zero values). For all other graphs, the simple slopes are shown for three levels of the 3rd explanatory variable: at the 1st, 2nd and 3rd quartile. Regression lines show the predicted abundance from the GLMM (in counts) when all other predictors are held constant at mean values. Shaded areas are ± 1 SE. See Table S11 for interaction confidence intervals.

Table S11: Coefficients and 95% (Wald) confidence intervals from exploratory models of abundance of all pollinators and sub-groups. All models were GLMMs with negative binomial distributed errors (quadratic parameterisation). Note that floral resources and insecticides were log transformed, and all explanatory variables were scaled and centred. Figures in bold denote significant terms (CI's do not encompass zero).

	All pollinators		Bumblebees		Solitary bees		Hoverflies	
	Estimate	**95% CI**	**Estimate**	**95% CI**	**Estimate**	**95% CI**	**Estimate**	**95% CI**
Intercept	**4.32**	**3.02, 5.62**	0.80	-0.91, 2.51	-1.85	-4.65, 0.96	**3.87**	**2.14, 5.59**
Honeybees	0.06	-0.02, 0.14	0.08	-0.03, 0.19	**0.20**	**0.06, 0.35**	-0.01	-0.12, 0.10
Floral resources	-0.02	-0.14, 0.10	0.13	-0.03, 0.29	-0.03	-0.23, 0.17	-0.07	-0.22, 0.09
Insecticides	0.13	-0.09, 0.34	0.11	-0.19, 0.42	0.16	-0.18, 0.50	0.11	-0.18, 0.40
Habitat diversity	-0.12	-0.28, 0.04	-0.09	-0.30, 0.13	**-0.42**	**-0.68, -0.16**	0.03	-0.18, 0.24
Floral resource diversity	-0.07	-0.19, 0.06	0.03	-0.14, 0.20	-0.15	-0.34, 0.03	-0.04	-0.20, 0.13
Seminatural habitat	-0.11	-0.33, 0.11	0.21	-0.09, 0.51	-0.13	-0.50, 0.24	-0.29	-0.59, 0.00
Habitat proximity	0.15	-0.03, 0.32	-0.05	-0.29, 0.19	**0.55**	**0.23, 0.88**	0.05	-0.18, 0.27
No of trap bowls	0.01	-0.02, 0.04	0.04	0.00, 0.07	**0.09**	**0.03, 0.15**	0.01	-0.03, 0.05
Year (2013)	**-0.61**	**-0.77, -0.45**	0.08	-0.14, 0.31	**-0.76**	**-0.99, -0.53**	**-0.71**	**-0.92, -0.50**
Honeybees: Floral resources	-0.04	-0.14, 0.06	-0.02	-0.15, 0.12	-0.10	-0.22, 0.03	-0.08	-0.22, 0.06
Honeybees: Insecticides	0.12	-0.01, 0.24	0.07	-0.10, 0.24	0.09	-0.10, 0.27	0.07	-0.09, 0.24
Honeybees: Habitat diversity	**-0.22**	**-0.36, -0.09**	-0.10	-0.28, 0.09	**-0.26**	**-0.45, -0.06**	-0.17	-0.35, 0.00
Honeybees: Floral resource diversity	0.02	-0.07, 0.11	-0.06	-0.18, 0.06	0.01	-0.11, 0.13	0.05	-0.07, 0.17
Honeybees: Seminatural habitat	-0.01	-0.15, 0.13	-0.08	-0.27, 0.11	-0.20	-0.43, 0.03	0.00	-0.18, 0.18
Honeybees: Habitat proximity	**0.25**	**0.09, 0.40**	0.13	-0.09, 0.36	**0.31**	**0.06, 0.56**	0.19	-0.02, 0.39
Floral resources: Insecticides	**-0.17**	**-0.33, -0.01**	**-0.22**	**-0.43, -0.01**	0.00	-0.24, 0.24	-0.19	-0.40, 0.02
Floral resources: Habitat diversity	0.10	-0.05, 0.25	0.14	-0.06, 0.34	0.12	-0.08, 0.32	0.15	-0.05, 0.35
Floral resources: Floral resource diversity	0.02	-0.08, 0.11	0.04	-0.08, 0.17	0.11	-0.01, 0.24	0.01	-0.12, 0.14
Floral resources: Seminatural habitat	**-0.28**	**-0.44, -0.12**	**-0.26**	**-0.48, -0.05**	-0.01	-0.26, 0.24	**-0.33**	**-0.55, -0.11**
Floral resources: Habitat proximity	0.15	-0.03, 0.33	0.04	-0.20, 0.29	-0.05	-0.30, 0.21	0.16	-0.08, 0.40
Habitat diversity: Insecticides	**-0.22**	**-0.43, -0.02**	-0.20	-0.49, 0.09	-0.35	-0.71, 0.00	-0.11	-0.39, 0.16
Floral resource diversity: Insecticides	0.03	-0.11, 0.18	**-0.22**	**-0.42, -0.01**	0.11	-0.11, 0.33	0.16	-0.04, 0.36
Insecticides : Seminatural habitat	**0.38**	**0.16, 0.59**	0.17	-0.12, 0.45	0.19	-0.14, 0.52	**0.33**	**0.04, 0.61**
Insecticides : Habitat proximity	-0.05	-0.27, 0.17	0.08	-0.23, 0.39	0.15	-0.22, 0.52	-0.17	-0.45, 0.11
Habitat diversity: Floral resource diversity	-0.08	-0.23, 0.06	0.08	-0.12, 0.27	-0.05	-0.24, 0.13	-0.15	-0.34, 0.04
Habitat diversity: Seminatural habitat	0.04	-0.17, 0.24	0.01	-0.27, 0.30	-0.16	-0.54, 0.23	0.13	-0.13, 0.40
Habitat diversity: Habitat proximity	-0.02	-0.15, 0.11	0.05	-0.13, 0.22	-0.08	-0.31, 0.14	-0.03	-0.20, 0.14
Floral resource diversity: Seminatural habitat	0.00	-0.17, 0.16	-0.15	-0.38, 0.08	0.07	-0.16, 0.30	0.12	-0.11, 0.35
Floral resource diversity: Habitat proximity	0.10	-0.07, 0.27	-0.18	-0.43, 0.07	0.17	-0.10, 0.44	0.14	-0.08, 0.36
Seminatural habitat: Habitat proximity	0.03	-0.18, 0.24	0.10	-0.19, 0.39	0.19	-0.15, 0.52	-0.11	-0.37, 0.16
Site: Region standard deviation	**0.58**	**0.32, 1.07**	**0.62**	**0.32, 1.20**	**1.23**	**0.67, 2.28**	**0.75**	**0.41, 1.38**
Region standard deviation	**0.23**	**0.12, 0.42**	**0.33**	**0.19, 0.58**	**0.38**	**0.24, 0.59**	**0.26**	**0.11, 0.63**

Table S12: Coefficients and 95% (Wald) confidence intervals from exploratory models of species richness of all pollinators and sub-groups. All models were GLMMs with negative binomial distributed errors (quadratic parameterisation), except bumblebees and hoverflies (Poisson). Note that floral resources and insecticides were log transformed, and all explanatory variables were scaled and centred. Figures in bold denote significant terms (CI's do not encompass zero).

	All pollinators		Bumblebees		Solitary bees		Hoverflies	
	Estimate	95% CI	Estimate	95% CI	Estimate	95% CI	Estimate	95% CI
Intercept	**2.17**	**1.46, 2.88**	0.00	-1.36, 1.36	-2.05	-4.31, 0.21	**1.80**	**1.08, 2.52**
Honeybees	**0.06**	**0.02, 0.11**	0.04	-0.03, 0.11	**0.24**	**0.13, 0.36**	0.01	-0.04, 0.07
Floral resources	0.01	-0.05, 0.08	0.06	-0.05, 0.17	-0.02	-0.17, 0.14	0.03	-0.05, 0.10
Insecticides	-0.01	-0.13, 0.10	0.09	-0.11, 0.30	-0.15	-0.42, 0.12	-0.04	-0.17, 0.09
Habitat diversity	-0.06	-0.14, 0.03	0.02	-0.12, 0.16	-0.19	-0.40, 0.02	-0.02	-0.12, 0.08
Floral resource diversity	0.00	-0.06, 0.06	-0.03	-0.15, 0.08	-0.04	-0.18, 0.09	0.04	-0.04, 0.12
Seminatural habitat	-0.08	-0.20, 0.04	0.11	-0.09, 0.30	-0.11	-0.41, 0.18	**-0.20**	**-0.33, -0.06**
Habitat proximity	0.09	0.00, 0.19	-0.05	-0.20, 0.11	**0.30**	**0.04, 0.56**	0.06	-0.05, 0.17
No of trap bowls	0.02	0.00, 0.03	0.03	0.00, 0.06	**0.07**	**0.02, 0.12**	0.01	0.00, 0.03
Year (2013)	**-0.19**	**-0.27, -0.11**	0.00	-0.16, 0.16	**-0.39**	**-0.55, -0.22**	**-0.18**	**-0.28, -0.08**
Honeybees: Floral resources	-0.03	-0.09, 0.02	0.01	-0.08, 0.10	**-0.10**	**-0.19, 0.00**	-0.03	-0.10, 0.03
Honeybees: Insecticides	**0.07**	**0.00, 0.13**	0.04	-0.08, 0.15	-0.02	-0.17, 0.13	**0.10**	**0.02, 0.18**
Honeybees: Habitat diversity	**-0.11**	**-0.18, -0.03**	0.01	-0.11, 0.13	**-0.15**	**-0.31, 0.00**	**-0.11**	**-0.20, -0.03**
Honeybees: Floral resource diversity	0.00	-0.05, 0.04	-0.03	-0.11, 0.06	-0.01	-0.10, 0.07	0.02	-0.04, 0.07
Honeybees: Seminatural habitat	0.00	-0.08, 0.07	0.01	-0.12, 0.13	-0.06	-0.25, 0.13	0.04	-0.05, 0.13
Honeybees: Habitat proximity	**0.10**	**0.02, 0.19**	0.01	-0.13, 0.14	0.07	-0.13, 0.27	**0.10**	**0.00, 0.21**
Floral resources: Insecticides	-0.08	-0.16, 0.00	-0.14	-0.29, 0.01	0.00	-0.19, 0.19	-0.04	-0.14, 0.06
Floral resources: Habitat diversity	0.06	-0.01, 0.14	0.03	-0.11, 0.16	0.10	-0.04, 0.25	0.08	-0.01, 0.17
Floral resources: Floral resource diversity	0.02	-0.03, 0.07	0.04	-0.05, 0.12	0.08	-0.02, 0.18	-0.02	-0.08, 0.04
Floral resources: Seminatural habitat	**-0.12**	**-0.21, -0.04**	-0.11	-0.27, 0.04	0.03	-0.16, 0.22	**-0.15**	**-0.25, -0.04**
Floral resources: Habitat proximity	0.01	-0.08, 0.10	0.01	-0.15, 0.18	-0.14	-0.33, 0.05	0.06	-0.05, 0.17
Habitat diversity: Insecticides	-0.06	-0.17, 0.05	0.00	-0.19, 0.19	-0.22	-0.51, 0.07	-0.02	-0.14, 0.10
Floral resource diversity: Insecticides	0.05	-0.03, 0.13	**-0.15**	**-0.29, 0.00**	0.17	0.00, 0.34	0.08	-0.01, 0.18
Insecticides : Seminatural habitat	0.09	-0.03, 0.20	0.07	-0.12, 0.25	-0.05	-0.31, 0.21	0.05	-0.09, 0.18
Insecticides : Habitat proximity	0.00	-0.12, 0.12	-0.03	-0.24, 0.18	0.19	-0.13, 0.50	-0.06	-0.20, 0.07
Habitat diversity: Floral resource diversity	-0.03	-0.10, 0.05	0.05	-0.07, 0.18	-0.04	-0.19, 0.11	-0.02	-0.11, 0.07
Habitat diversity: Seminatural habitat	0.01	-0.10, 0.12	0.02	-0.19, 0.22	-0.12	-0.44, 0.19	0.07	-0.05, 0.19
Habitat diversity: Habitat proximity	0.03	-0.04, 0.10	0.08	-0.03, 0.20	0.00	-0.19, 0.19	0.03	-0.05, 0.11
Floral resource diversity: Seminatural habitat	0.00	-0.09, 0.09	-0.11	-0.27, 0.05	0.11	-0.06, 0.28	0.01	-0.11, 0.13
Floral resource diversity: Habitat proximity	0.05	-0.04, 0.14	-0.07	-0.23, 0.08	0.01	-0.20, 0.22	0.09	-0.02, 0.19
Seminatural habitat: Habitat proximity	0.04	-0.08, 0.15	-0.04	-0.23, 0.15	0.18	-0.11, 0.47	-0.01	-0.14, 0.12
Site: Region standard deviation	**0.13**	**0.08, 0.22**	0.00	0.00, Inf	**0.32**	**0.22, 0.48**	**0.11**	**0.05, 0.25**
Region standard deviation	**0.39**	**0.21, 0.72**	**0.23**	**0.09, 0.57**	**1.21**	**0.67, 2.20**	**0.29**	**0.16, 0.54**

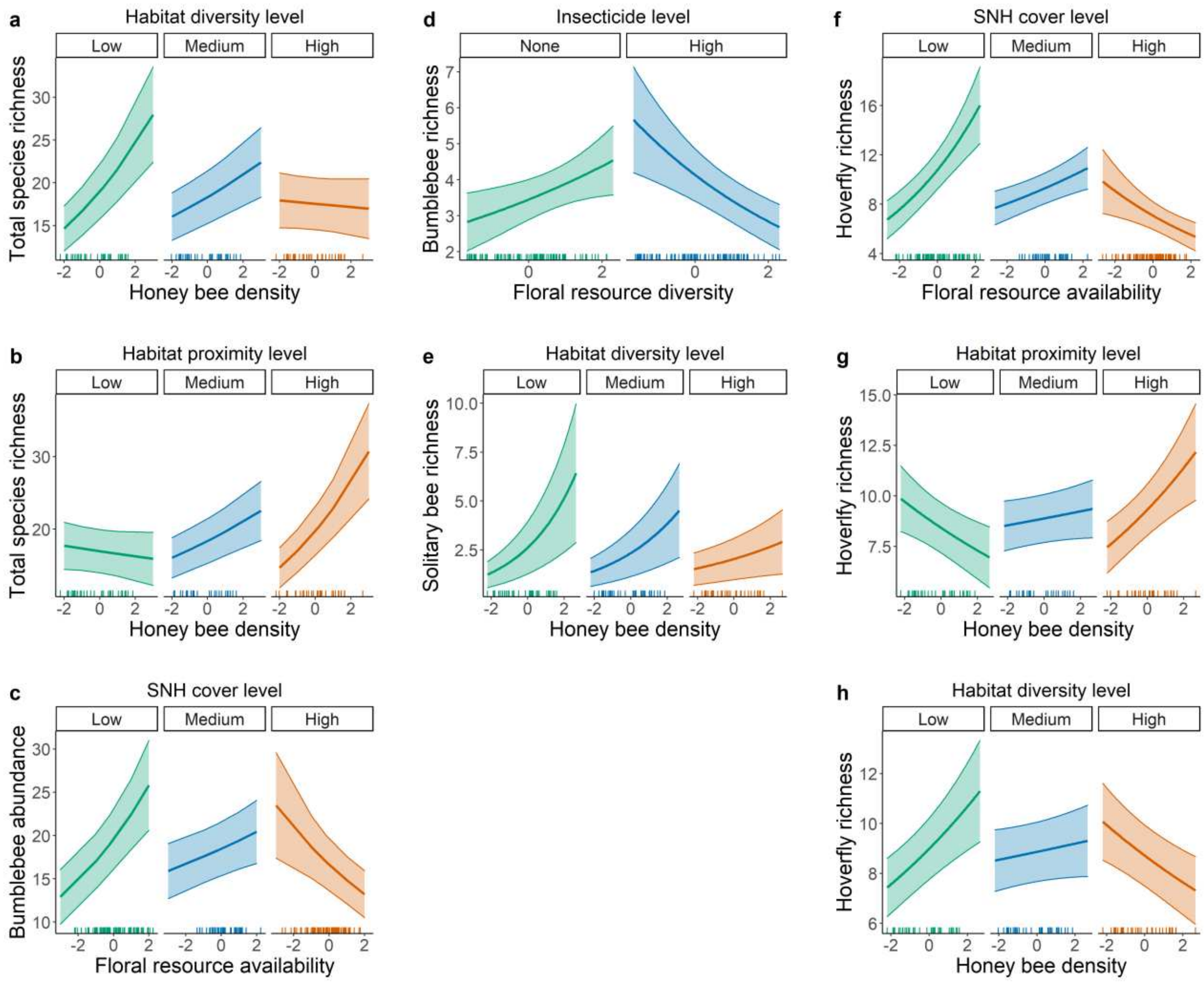

Figure S3: Interaction graphs for selected significant interactive effects of landscape drivers on a), b) & c) total species richness, d) bumblebee richness, e) solitary richness, and f), g) & h) hoverfly richness. Interactions shown here are those not included in the main text. For graph d) the two panels show simple slopes when insecticides are held constant at zero, and when insecticides are "high" (median insecticides for sites with non-zero values). For all other graphs, the simple slopes are shown for three levels of the 3rd explanatory variable: at the 1st, 2nd and 3rd quartile. Regression lines show the predicted richness from the GLMM (in counts) when all other predictors are held constant at mean values. Shaded areas are ± 1 SE. See Table S12 for interaction confidence intervals.

Table S13: **Coefficients and 95% (Wald) confidence intervals from exploratory models of diversity (Inverse Simpson index) of all pollinators and sub-groups. All models were GLMMs with Gamma (log link) distributed errors (quadratic parameterisation). Note that floral resources and insecticides were log transformed, and all explanatory variables were scaled and centred. Figures in bold denote significant terms (CI's do not encompass zero).**

	All pollinators		Bumblebees		Solitary bees		Hoverflies	
	Estimate	**95% CI**	**Estimate**	**95% CI**	**Estimate**	**95% CI**	**Estimate**	**95% CI**
Intercept	0.87	-0.08, 1.83	0.85	-0.02, 1.72	0.62	-1.01, 2.26	0.70	-0.17, 1.57
Honeybees	**0.07**	**0.02, 0.13**	0.00	-0.05, 0.05	**0.13**	**0.06, 0.19**	0.04	-0.01, 0.10
Floral resources	0.04	-0.05, 0.13	0.04	-0.04, 0.11	0.03	-0.08, 0.14	0.07	-0.02, 0.16
Insecticides	-0.02	-0.18, 0.13	0.09	-0.05, 0.22	-0.14	-0.31, 0.03	0.06	-0.11, 0.23
Habitat diversity	-0.01	-0.13, 0.11	0.05	-0.04, 0.14	0.05	-0.08, 0.18	-0.10	-0.21, 0.02
Floral resource diversity	0.04	-0.05, 0.14	-0.02	-0.10, 0.06	0.05	-0.06, 0.16	0.08	-0.02, 0.17
Seminatural habitat	-0.01	-0.17, 0.15	0.05	-0.08, 0.19	-0.08	-0.25, 0.10	0.01	-0.14, 0.17
Habitat proximity	0.05	-0.08, 0.18	-0.02	-0.13, 0.08	-0.08	-0.26, 0.10	0.07	-0.05, 0.19
No of trap bowls	0.02	0.00, 0.04	0.00	-0.02, 0.02	0.02	-0.01, 0.06	0.01	-0.01, 0.03
Year (2013)	**0.17**	**0.04, 0.30**	-0.07	-0.18, 0.04	-0.05	-0.20, 0.09	0.09	-0.04, 0.22
Honeybees: Floral resources	-0.03	-0.11, 0.05	-0.01	-0.08, 0.05	0.01	-0.07, 0.10	-0.05	-0.13, 0.03
Honeybees: Insecticides	0.05	-0.04, 0.14	0.06	-0.02, 0.14	0.00	-0.10, 0.10	0.08	-0.02, 0.18
Honeybees: Habitat diversity	-0.05	-0.14, 0.05	0.03	-0.06, 0.11	-0.07	-0.18, 0.04	-0.08	-0.17, 0.01
Honeybees: Floral resource diversity	0.01	-0.06, 0.08	-0.01	-0.07, 0.04	**0.09**	**0.02, 0.16**	-0.02	-0.09, 0.05
Honeybees: Seminatural habitat	0.02	-0.09, 0.12	0.07	-0.01, 0.16	-0.05	-0.17, 0.06	0.00	-0.10, 0.11
Honeybees: Habitat proximity	0.02	-0.10, 0.13	-0.03	-0.13, 0.06	0.02	-0.12, 0.15	**0.11**	**0.00, 0.22**
Floral resources: Insecticides	-0.01	-0.13, 0.12	**-0.13**	**-0.23, -0.02**	-0.04	-0.18, 0.10	0.01	-0.10, 0.13
Floral resources: Habitat diversity	0.06	-0.06, 0.18	0.02	-0.08, 0.11	-0.01	-0.13, 0.12	0.08	-0.03, 0.20
Floral resources: Floral resource diversity	0.00	-0.07, 0.07	0.06	0.00, 0.12	0.04	-0.04, 0.12	-0.04	-0.11, 0.03
Floral resources: Seminatural habitat	0.00	-0.13, 0.12	-0.04	-0.15, 0.07	0.06	-0.08, 0.19	-0.10	-0.23, 0.02
Floral resources: Habitat proximity	-0.05	-0.19, 0.09	-0.05	-0.16, 0.07	-0.11	-0.26, 0.05	0.10	-0.04, 0.24
Habitat diversity: Insecticides	0.15	-0.01, 0.30	**0.14**	**0.02, 0.27**	0.01	-0.16, 0.17	0.05	-0.10, 0.20
Floral resource diversity: Insecticides	0.08	-0.04, 0.19	**-0.11**	**-0.21, -0.02**	0.07	-0.06, 0.20	0.01	-0.11, 0.13
Insecticides : Seminatural habitat	-0.13	-0.29, 0.02	0.00	-0.13, 0.12	-0.12	-0.29, 0.05	-0.05	-0.20, 0.10
Insecticides : Habitat proximity	**-0.20**	**-0.36, -0.03**	-0.13	-0.27, 0.00	0.16	-0.03, 0.35	-0.15	-0.31, 0.01
Habitat diversity: Floral resource diversity	0.04	-0.06, 0.15	0.02	-0.07, 0.11	-0.08	-0.20, 0.05	0.07	-0.04, 0.18
Habitat diversity: Seminatural habitat	0.09	-0.06, 0.24	0.05	-0.07, 0.17	0.00	-0.17, 0.18	0.09	-0.06, 0.24
Habitat diversity: Habitat proximity	0.05	-0.04, 0.15	**0.12**	**0.04, 0.20**	0.04	-0.07, 0.15	-0.01	-0.10, 0.08
Floral resource diversity: Seminatural habitat	0.03	-0.10, 0.17	-0.07	-0.18, 0.04	0.05	-0.09, 0.19	-0.08	-0.21, 0.05
Floral resource diversity: Habitat proximity	0.00	-0.12, 0.13	-0.04	-0.14, 0.07	-0.06	-0.23, 0.11	0.10	-0.02, 0.23
Seminatural habitat: Habitat proximity	-0.13	-0.28, 0.02	-0.10	-0.23, 0.02	0.10	-0.06, 0.27	-0.05	-0.20, 0.09
Site: Region standard deviation	0.00	0.00, Inf	0.00	0.00, Inf	0.00	0.00, Inf	0.00	0.00, Inf
Region standard deviation	**0.39**	**0.21, 0.74**	**0.13**	**0.05, 0.35**	**0.53**	**0.28, 0.98**	**0.15**	0.05, 0.42

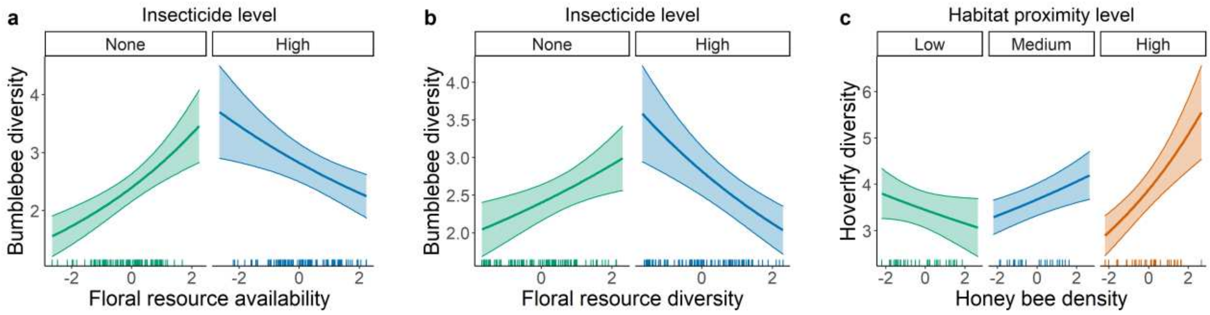

Figure S4**:** Interaction plots for of selected significant interactive effects of landscape drivers on a) & b) bumblebee diversity, and c) hoverfly diversity. Interactions shown here are those not included in the main text. For graphs a) and b) the two panels show simple slopes when insecticides are held constant at zero, and when insecticides are "high" (median insecticides for sites with non-zero values). For graph c), the simple slopes are shown for three levels of the 3rd explanatory variable: at the 1st, 2nd and 3rd quartile. Regression lines show the predicted diversity from the GLMM when all other predictors are held constant at mean values. Shaded areas are ± 1 SE. See Table S13 for interaction confidence intervals.