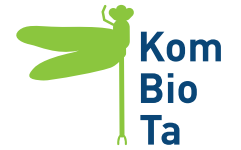




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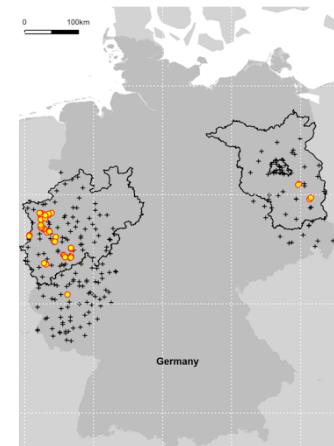
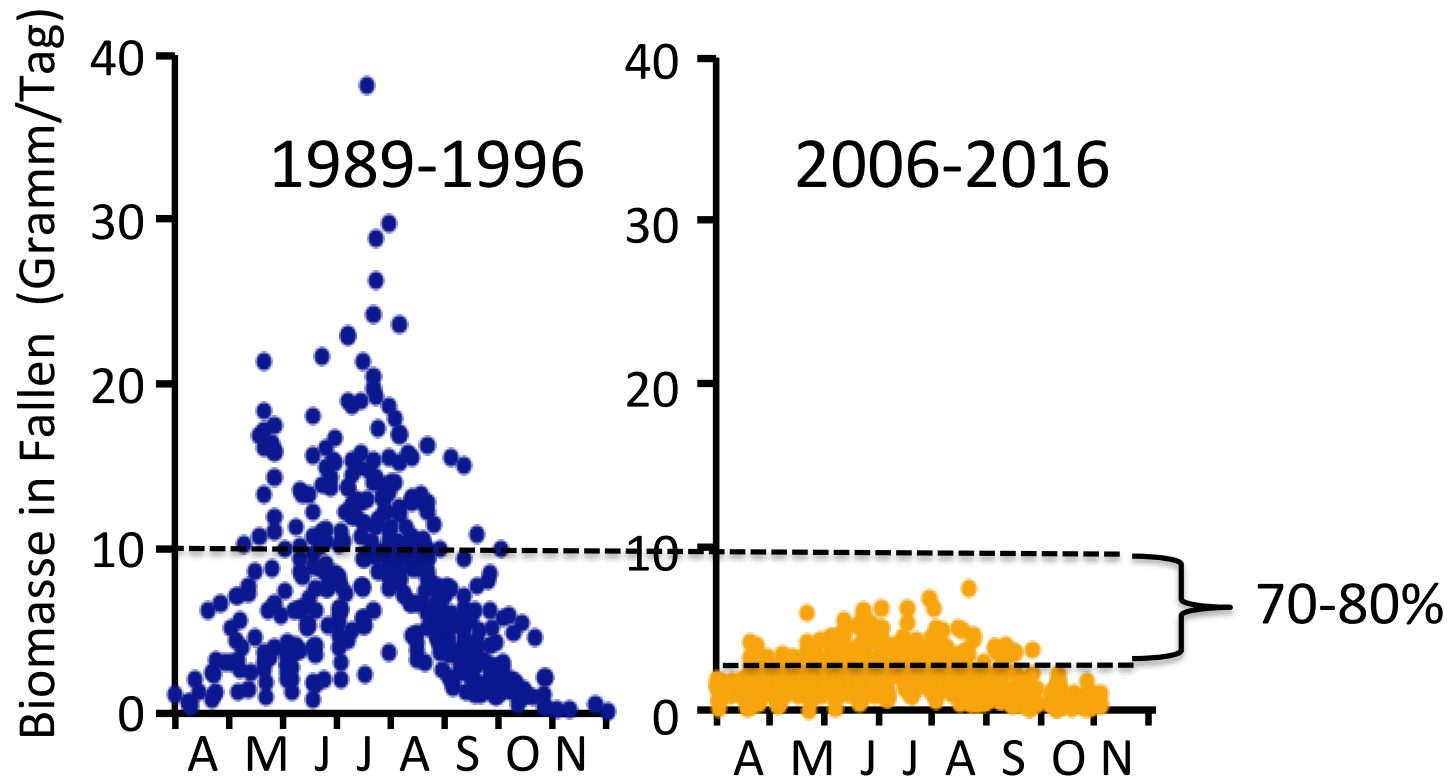
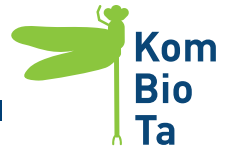
Parks, Gärten, Straßenränder: Arche Noah für Insekten?

Prof. Dr. Johannes Steidle
Universität Hohenheim



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Die „Krefeld Studie“...

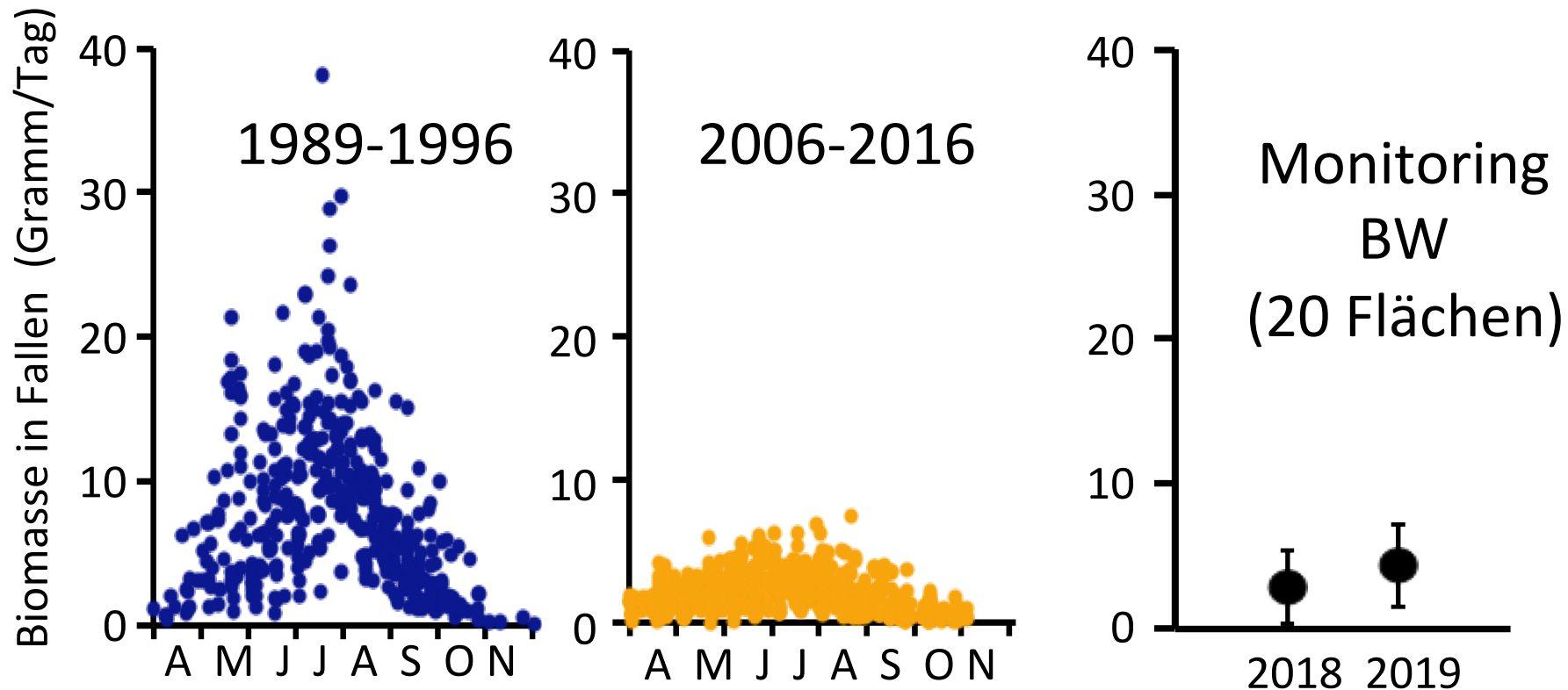


**Standorte
„Krefelder
Studie“**

Abnahme um 70-80%



...die Lage in BW...



Auch in BW gibt es zu wenig Insekten!



...und den Biodiversitäts- observatorien der DFG*

Lebensraum	Biomasse	Häufigkeit	Artenzahl
Grünland	-67%	-78%	-34%
Wald	-41%	-	-36%

Untersuchung von 150 Flächen im Grünland (2008-2017) und 140 im Wald (2008-2016). Probennahme vieler Artengruppen mit standardisierten Methoden



designed by freepik.com

Gravierende Abnahmen schon in 10 Jahren (2008-2017), und auch im Wald

Neue & neueste Arbeiten

Where have all the beetles gone? Long-term monitoring reveals carabid species decline in a nature reserve in Northern Germany

Where have all the beetles gone?
reveals carabid species decline in
Northern Germany

KATHARINA HOMBURG,^{1,2,*} CLAUDIA DREES,^{3,*} WIBKE SCHUETT,⁴
ESTÈVE BOUTAUD,² DOROTHEA NOLTE,² EICK VON RUSCHKOWSKI¹ and
PASCALE ZUMSTEIN,² Alfred Toepfer Academy for Nature Conservation, Schneverdingen, Germany,
THORSTEN ASSMANN² ¹Alfred Toepfer Academy for Nature Conservation, Schneverdingen, Germany, ²Institute of Zoology, Universität Hamburg,
³University of Sussex, Brighton, UK

PROCEEDINGS B

royalsocietypublishing.org/journal/rspb

Research

Narrow habitat breadth and late-summer emergence increases extinction vulnerability in Central European bees

Constantin M. Zohner² and Susanne S. Renner¹

**Protected areas do not
study on butterflies**

Stanislav Rada^{1,2} | Tomáš Kuras² | Josef

Austral Entomology

Austral Entomology (2021) 60, 9–26

Symposium: insect decline and conservation

Review

Further evidence for a global decline of the entomofauna

Francisco Sánchez-Bayo^{1*} and Kris A G Wyckhuys^{2,3,4}

²School of Biological Sciences, University of Queensland, Goddard Building, Brisbane, QLD 4072, Australia.

³Institute of Plant Protection, China Academy of Agricultural Sciences, No. 2 West Yuanmingyuan Rd., Ha Beijing 100193, China.

⁴Chrysalis Consulting, Nguyen Phong Sac, Cau Giay, Hanoi 100000, Vietnam.

Abstract

The Anthropocene is characterised by pervasive human-inflicted impacts on a broad range of insects. In 2019, we reviewed scientific literature quantifying the prevalence and magnitude of insect declines over the recent time. Here, drawing upon 40 additional long-term studies, we add evidence that is consistent with previous review and some other reviews on the fate of insect populations globally. New data for Greenland, South America, eastern Asia and Australia complement studies from Europe and North America. In insect populations are now derived from 100 long-term studies and refer mainly to the past (median 33 years). Data from the 10 major insect taxonomic orders indicate that an average 5% decline in numbers, while populations of 18% species are increasing; the latter taxa mainly are bivalves and nuisance pests. Population changes are more pronounced among aquatic insects. 42% of species are declining and 29% increasing. Such changes result in a decrease in biodiversity for Heteroptera. Changes in species richness and diversity indices are inconsistent and population changes over time. These trends are observed irrespective of taxon, geographic region or approach, although a lack of long-term monitoring records prevents a proper assessment of the magnitude of change.

Key words abundance, biomass, diversity indices, insects, population trends

INTRODUCTION

Following the recent publication of several reports on the decline of insects and other arthropods in areas of Europe and Central America (Hallmann *et al.* 2017; Lister and Garcia 2018; Seibold *et al.* 2019; van Strien *et al.* 2019; Hallmann *et al.* 2020) as well as our review of patterns at the global level (Sánchez-Bayo and Wyckhuys 2019), numerous authors have made available their data to the public. It is therefore appropriate for us to compile these new data and discuss the overall findings from a perspective that in-

report (Table 1), discussed by taxonomists and ecologists. The references about long-term studies in peer-reviewed journals between 1980 and 2000 are listed as two papers in this symposium. The first paper reports on individual species as two-sample 'snapshots' of a population at one location or multiple sites, where the data are collected over entire periods. The largest number of studies (17%) in North America (17%)

Recent reports from lowland Germany have demonstrated a 3/4 loss in the biomass of flying insects in protected areas over a period of less than 30 y (1), as well as severe declines in abundance for several groups of insect species (2). These findings question the stability of ecosystem functioning under contemporary European land use. A biomass drop of this magnitude hardly be envisaged without cascading trophic effects on most of these potentially far-reaching consequences will depend on the nature of the decline and nutrient cycling (3–5) or diversity of the insect species in question (10). Hence, there is an urgent need to unravel species with respect to the decline and to translate into declines in the abundance and total insect species.

Long-term, taxon-specific studies have shown that past decades (11) have seen a decline in insect biomass in insect decline | temporal scaling

species only.

Next, we here examine the relationship between total insect biomass and diversity in an insect family: the hoverflies (Syrphidae). Hoverflies are considered important wild pollinators (28–30). Hoverflies are considered important wild pollinators (34, 35), and hence a potentially informative group of insects, representative for a variety of ecological functions. All hoverfly individuals caught in six trap locations in German nature reserves in two seasons that were 25 y apart (1989 vs. 2014, two endpoints of the trend in the Krefeld data in Figure 1, with identical trap locations in each season) as described in ref. 1, with identical trap locations in each season) were identified at the species level, amounting to 19,604 individuals of 162 species from 59 genera.

Insect biomass decline scaled to species diversity: General patterns derived from a hoverfly community

Caspar A. Hallmann^{a,*}, Axel Ssymy^b, Martin Sorg^c, Hans de Kroon^d, and Eelke Jongejans^e

^aInstitute for Water and Wetland Research, Radboud University, 6525AP Nijmegen, The Netherlands; ^bDepartment of Biology, University of Nevada, Reno, NV, and accepted by Editorial Office of *Journal of Applied Ecology*; ^cDepartment of Biology, University of Cologne, 50676 Cologne, Germany; ^dDepartment of Biology, University of Groningen, 9700 SB Groningen, The Netherlands; ^eDepartment of Biology, University of Groningen, 9700 SB Groningen, The Netherlands

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Received 14 March 2018; accepted 14 May 2018; handling editor: Dr. David Gibson

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Global patterns derived from a hoverfly community

Caspar A. Hallmann^{a,1}, Axel Ssymank^b, Martin Sorg^c, Hans de Kroon^d, and Eelke Jongejans^e

^aInstitute for Water and Wetland Research, Radboud University, 6525HP Nijmegen, The Netherlands; ^bDepartment II 2.2 "Water and Wetland Research", Bundesamt für Naturschutz, 53179 Bonn, Germany; and ^cEntomological Society Krefeld, D 47798 Krefeld, Germany; ^dDepartment of Biology, University of Nevada, Reno, NV, and accepted by Editorial Board March 16, 2020; ^eDepartment II 2.2 "Water and Wetland Research", Bundesamt für Naturschutz, 53179 Bonn, Germany

Reports of declines in biomass of flying insects have alarmed the world in recent years. However, how biomass declines and diversity loss is still an open question. Here, we present the first large-scale analysis of biomass and diversity of hoverflies (Diptera: Syrphidae), at six locations in 16 of 162 localities in Germany, and compare the results with those of other insect groups.

[illegible]

declines as well as abundance changes at the species level, as well as changes in diversity metrics at the community level, requires that we account for the stochastic nature of the processes involved (e.g., higher extinction rates than predicted by the field (*i.e.*, species with low abundance during sampling) prevents a straightforward comparison of rare species' declines over time (27)). To facilitate a meaningful insect assembly measures (Hill numbers) are theoretically integrated, contrasting scenarios of decline rates are integrated, rare species abundance axis. Such a framework is also crucial for properly interpreting empirical data of declining common-tors

Next, we here examine the relationship between biomass and diversity in an insect assemblage (Synanthrope (Syrphidae), Hovellers (Hymenoptera), and Hymenoptera (Hymenoptera)) and biodiversity (Biodiversity)

insects, predators and parasitoids are considered important within total insect fauna (34, 35), and hence a biocoenotic (31–33), suitable as reserves in two seasons that were 25 y apart (1989 vs. 2014, two endpoints of the trend in the Krefeld data as described in ref. 1, with identical trap locations in each season) were identified at the species level, amounting to 19,604 individuals of 162 species from 59 genera.

Review

ELSEVIER

Contents lists available at ScienceDirect

Biological Conservation

journal homepage: www.elsevier.com/locate/bioco

ELSEVIER

Review

Worldwide decline of the entomofauna: A review of
Francisco Sánchez-Bayo^{a,*}, Kris A.G. Wyckhuys^{b,c,d}

^aEnvironmental Sciences, Sydney Institute of Agriculture, The University of Sydney, Eveleigh, NSW
^bDepartment of Entomology, University of Queensland, St. Louis, Australia
^cDepartment of Entomology, University of Queensland, St. Louis, Australia
^dDepartment of Entomology, University of Queensland, St. Louis, Australia

Chin

^a School of Life & Environmental Sciences, Sydney University, Sydney, Australia
^b School of Biological Sciences, University of Queensland, Brisbane, Australia
^c Chrysalis, Hanoi, Viet Nam
^d Institute of Plant Protection, China Academy of Agricultural Sciences, Beijing, China

ABSTRACT

ABSTRACT

ABSTRACT

Biodiversity of insects is threatened world-wide. Insect declines are occurring across the globe at dramatic rates of decline that may lead to the extinction of many species within a few decades. In terrestrial ecosystems, Lepidoptera are declining at the highest rates. Taxa most at risk are those with the fewest species, already lost a considerable proportion of their ecological niches, but also with particular ecological niches that are increasing, and a small number of species are increasing, and niches are being replaced by the large biodiversity of insects. The main drivers of species decline are intensive agriculture, urbanisation, biological factors, including pathogens, and climate change. In tropical regions, particularly important zones. A rethinking of insect management and its substituting pesticide usage and its substituting slow or reverse current trends, in all system services they provide, in all waters in both agricultural and urban systems.

ARTICLE INFO

Keywords:
Extinction
Pollinators
Aquatic insects
Agriculture
Pesticides
Ecosystem services
Global change ecology

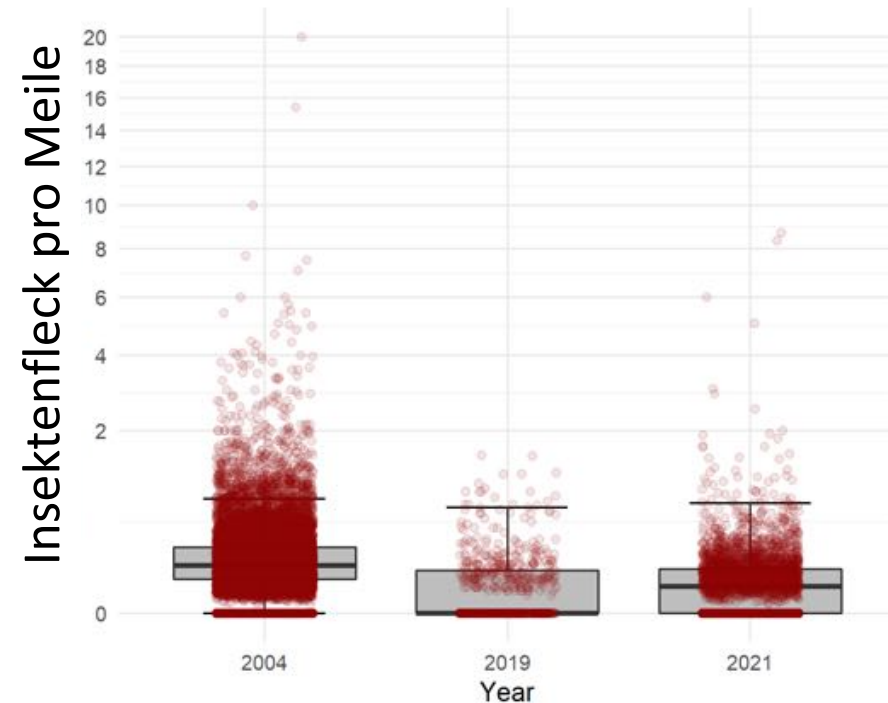
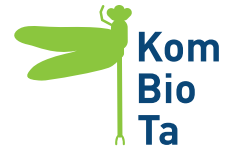
1. Introduction

1. Introduction



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Insekten auf Nummernschildern

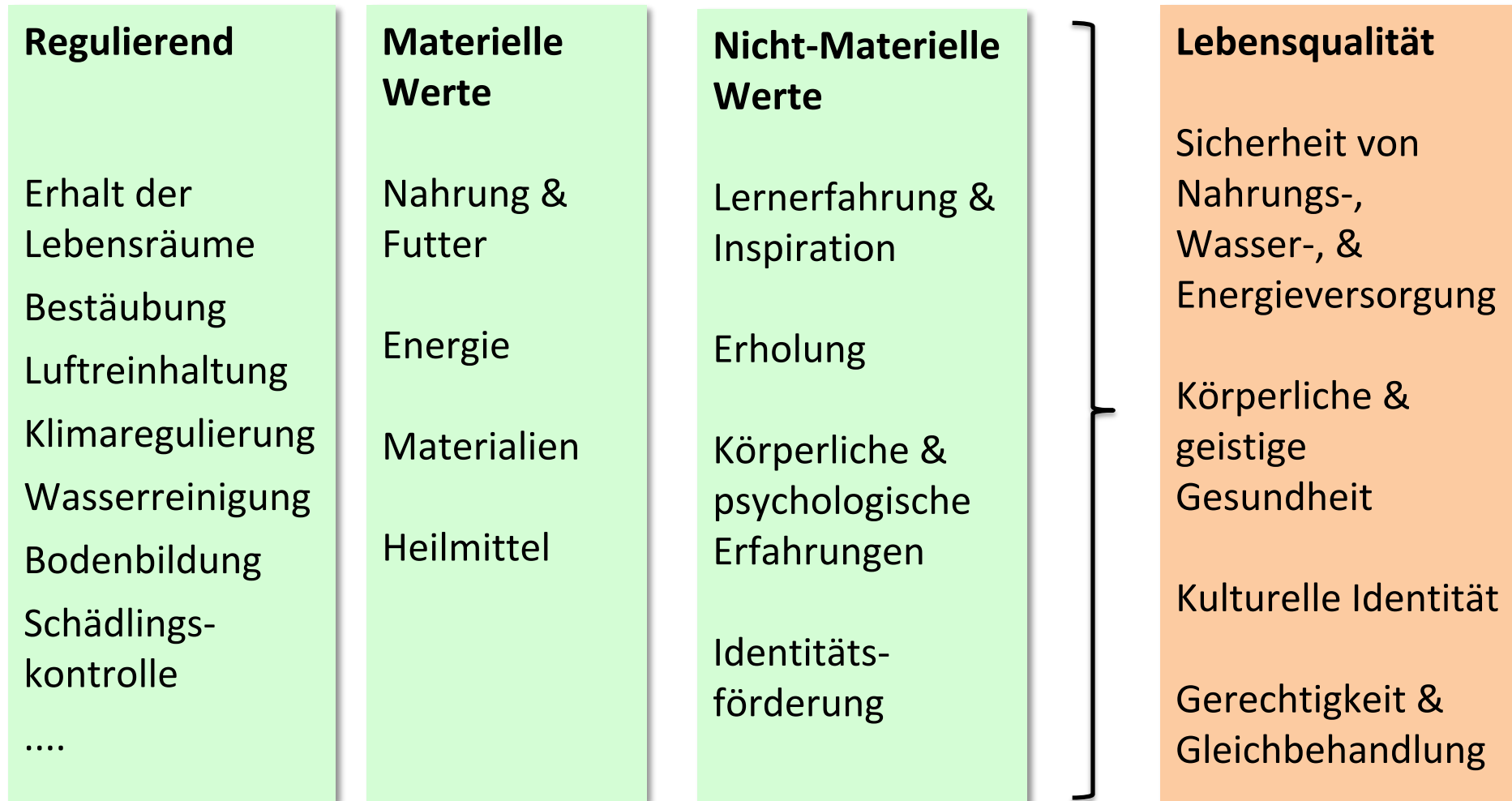
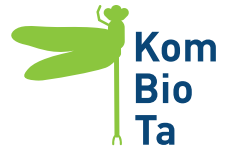


**Rückgang um 58,5% von 2004 bis 2021 in
Großbritannien**

Ball et al (2022). The Bugs Matter Citizen Science Survey: Counting insect splats' on vehicle number plates. Technical Report



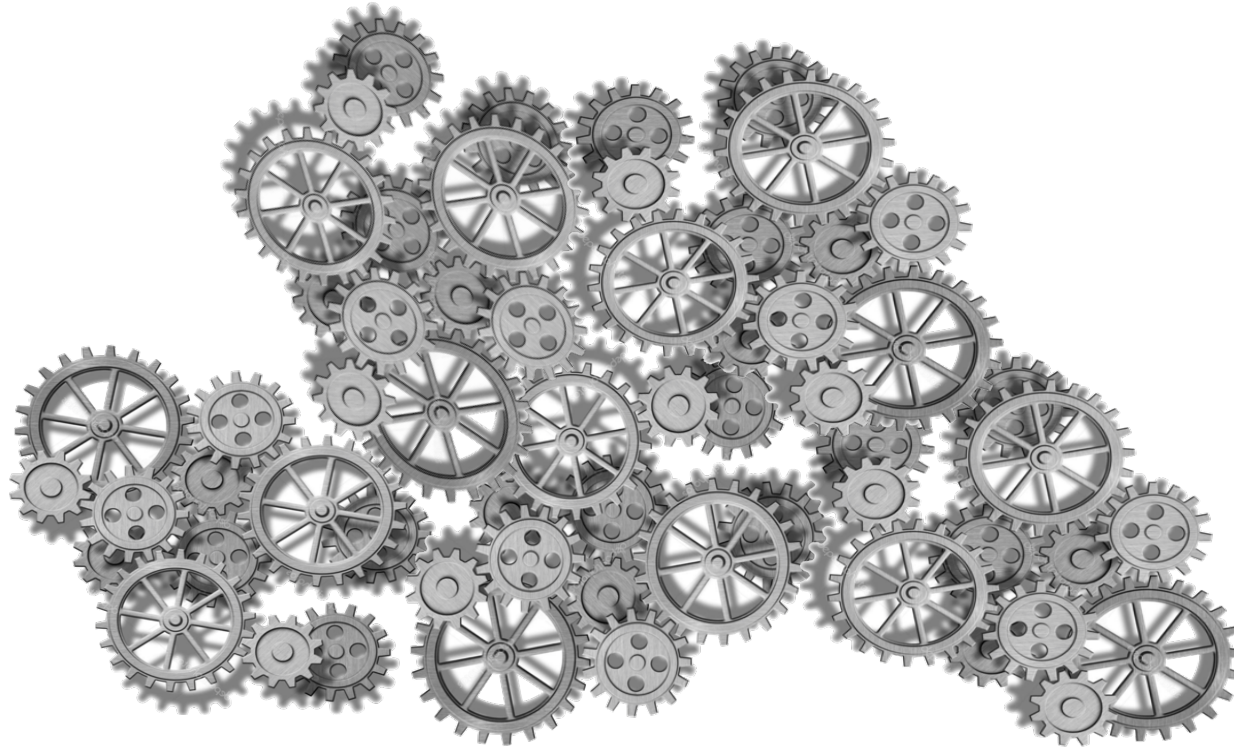
Ökosystemleistungen





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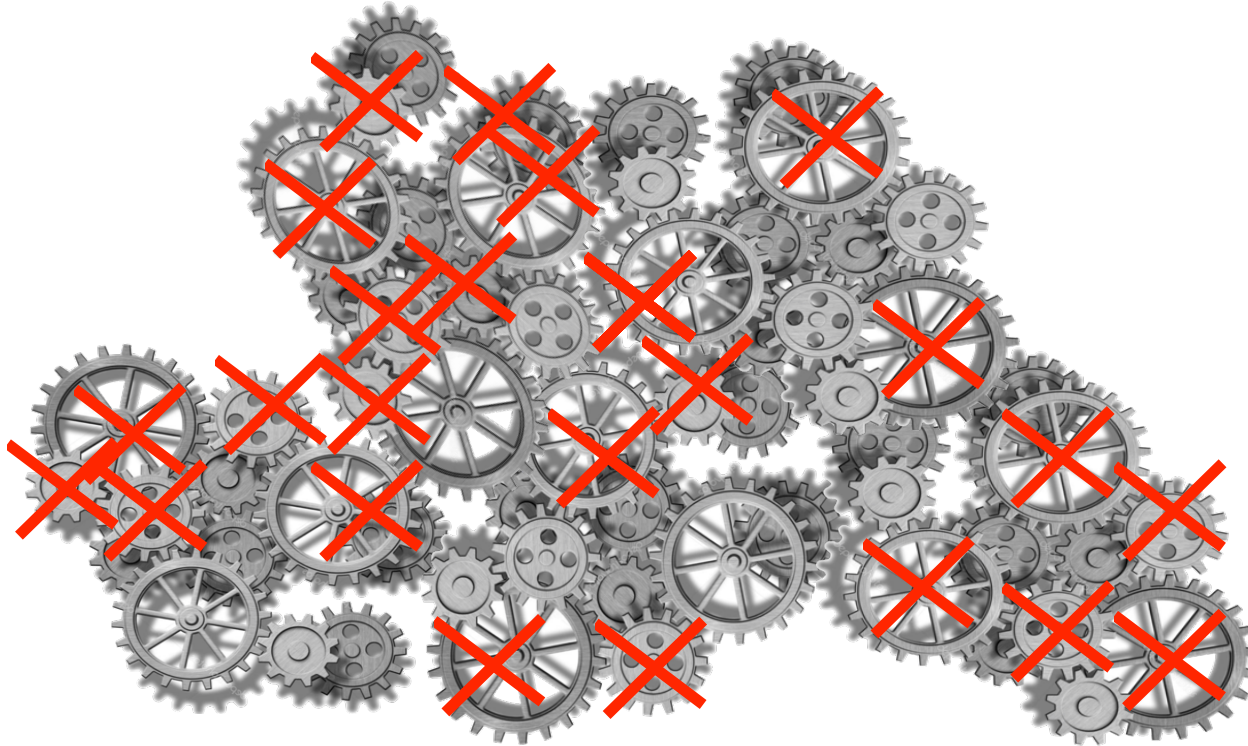
Ökosysteme als Maschinen



Urheberrecht: Andrey_Kuzmin Datei-ID: 10674778



Ökosysteme als Maschinen

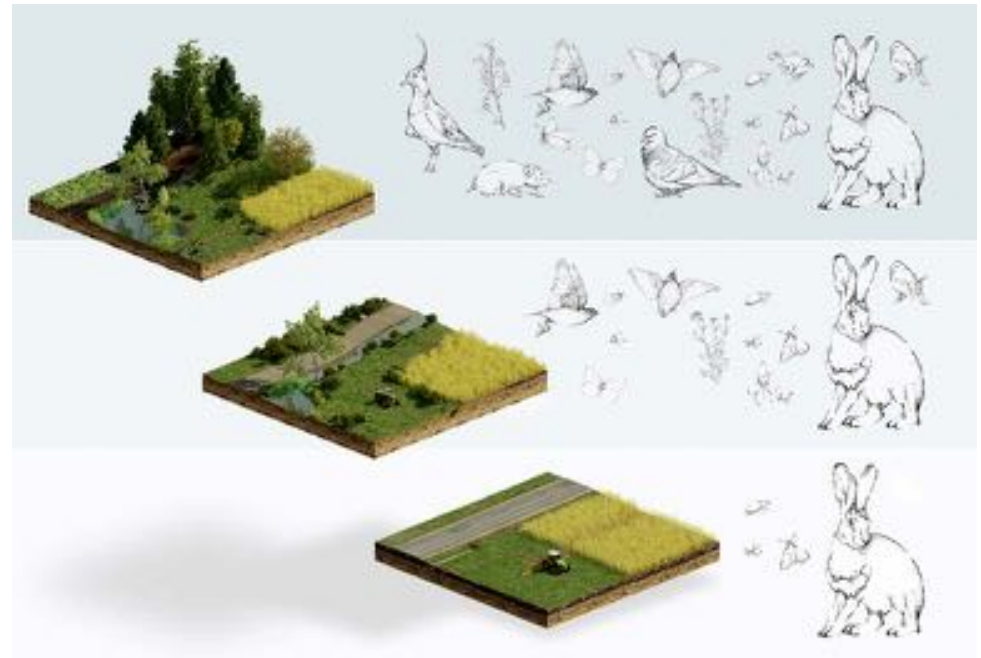


**> 70% aller Arten sind Insekten,
ohne sie geht nichts!**



Ursachen für Rückgang der Biodiversität

- **Verlust an Lebensraum**
- **Landnutzungs-Intensivierung**
- **Größere Feldflächen**
- **Weniger Strukturvielfalt**
- **Monokulturen/weniger Fruchtfolgen**
- **Flächendeckender Pflanzenschutz (Pestizide!)**
- **Verlust artenreiches Grünland**
- **Weniger Weidehaltung**
- **Verlust Vernetzung Schutzgebiete**

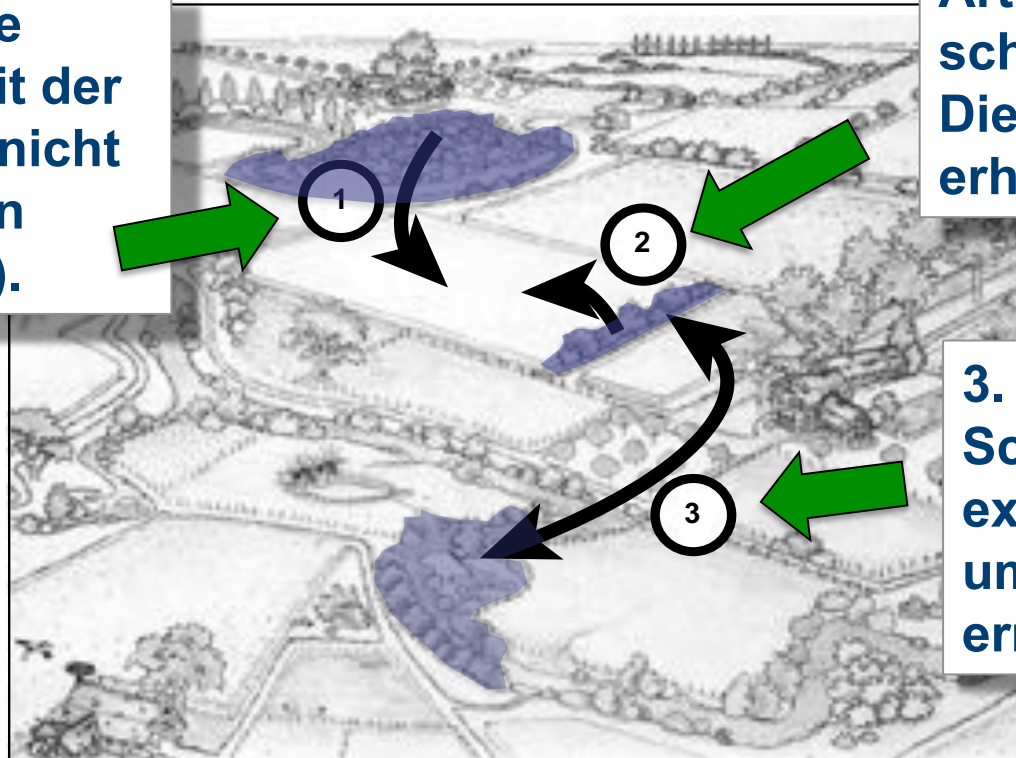




1. Schutzgebiete für Arten, die mit der Landwirtschaft nicht zurecht kommen (z.B. Moorarten).

2. Extensivflächen um Arten der Kulturlandschaft & ökosystemare Dienstleistungen zu erhalten

3. Vernetzung von Schutzgebieten & extensiven Flächen um Austausch zu ermöglichen



Schützen, extensivieren & vernetzen

Grass et al. 2019. People and Nature 1:262–272.



Biodiversität geht alle an

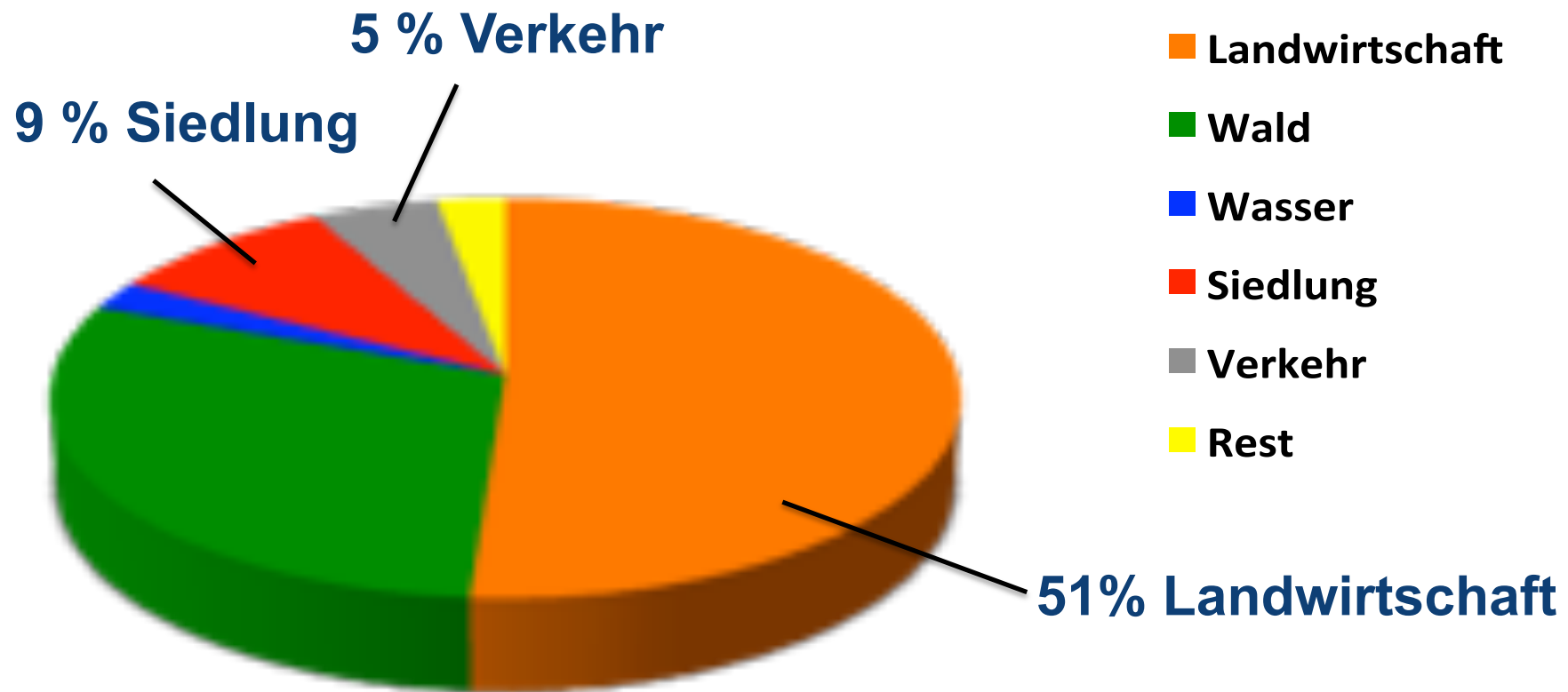
Politik

Gesellschaft

**Landwirt-
schaft**



Flächennutzung BRD



**Siedlungs- und Verkehrsflächen
umfassen 14% der Fläche!**



Siedlungen & Straßen: Arche Noah für Insekten?

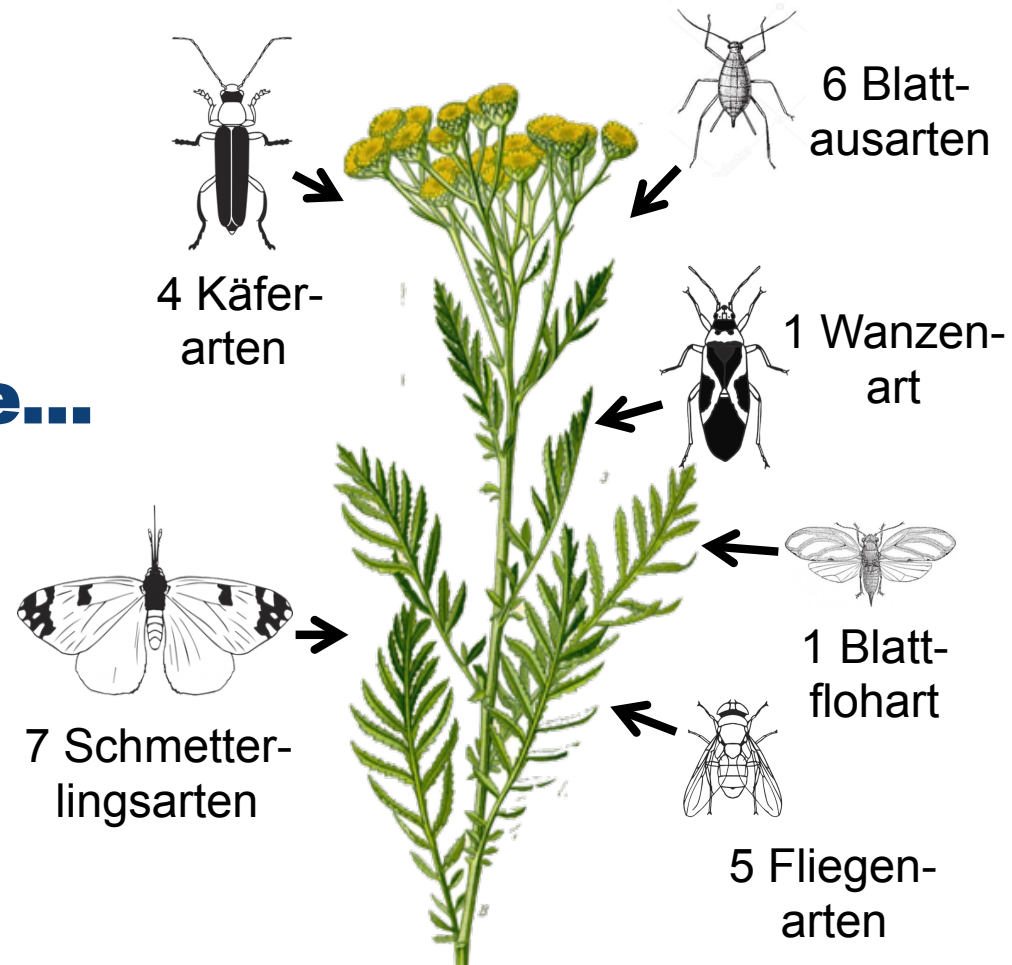
- **Urbanisierung verringert Biodiversität¹**
- + **Kein ökonomischer Druck auf Flächen: Maßnahmen leichter umzusetzen als auf landwirtschaftlichen Flächen.**
- + **Potentiell hoher Struktur-reichtum in (Vor)-Städten**
- + **z.B. mehr Nistplätzen & Blüten für Wildbienen als auf dem Land³**



¹Piano et al. 2020, Global Change Biology 26. ²Theodorou et al. 2020. Nature communications 11.¹⁴



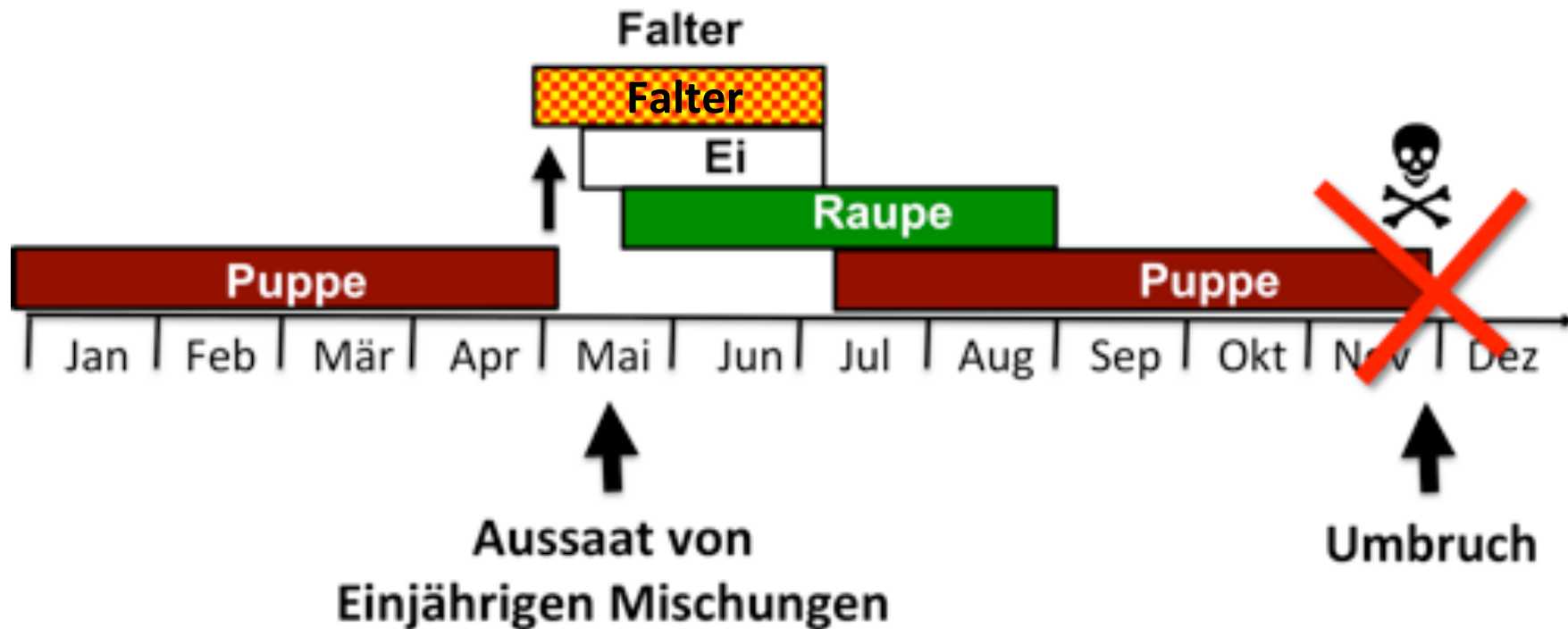
- **Standortfaktoren
(trocken, feucht,
warm, kühl...)**
- **Spezielle Habitate...
...für Eiablage
(Boden, Holz..)**
- **...und Nahrungs-
pflanzen**



Insektenarten an Rainfarn
(*Tanacetum vulgare*)



Überwinterung



**Viele Insekten benötigen
Überwinterungsmöglichkeiten in der
Vegetation**



© Naturpark
Stromberg-Heuchelberg

Honigbiene	Wildbiene
Nutztier	Wildtier
„fliegende Milchkühe“	
Schädigt Wildbienen durch Konkurrenz & Pathogene	konkurrenz- schwächer
Anzahl der Völker zunehmend	Bestand nimmt ab, viele Arten bedroht

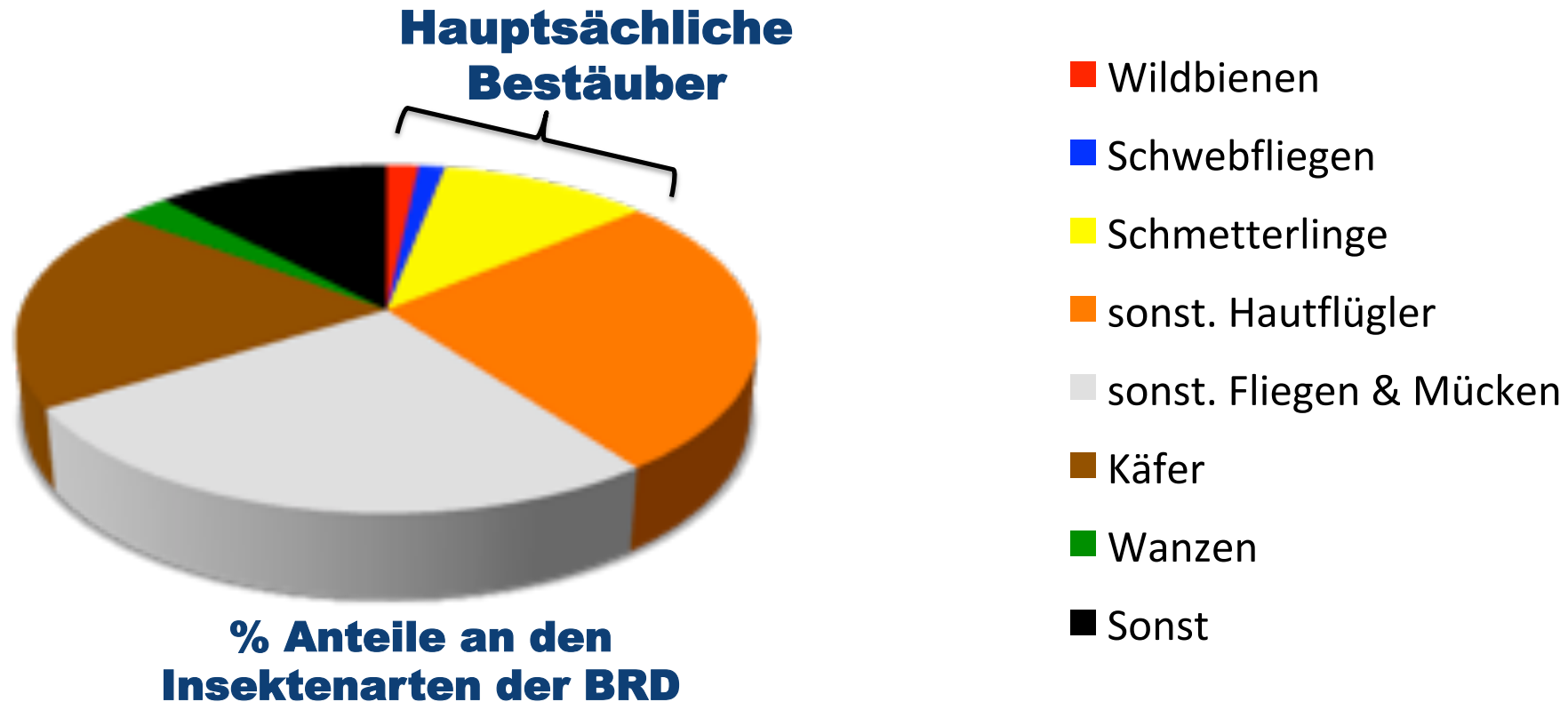
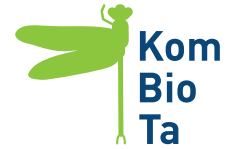
**Honigbienen sind NICHT bedroht,
sondern Wildbienen**

Geldmann, J. & González-Varo, J.P. 2018. Science 359: 392–393.

Mallinger et al. 2017. PLoS ONE 12(12): e0189268. <http://www.naturspaziergang.de>



Wildbienen sind nicht alles!



**Die meisten Insekten sind keine Wildbienen
oder Bestäuber, brauchen aber auch Schutz!**



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Der Garten- und Landschaftsbau: Nicht die Lösung, sondern das Problem!

**Anzeige des
Bundesverbandes Garten-,
Landschafts- und
Sportplatzbau e. V. (GALA)
in Computer Bild 21/2021
am 08.10.2021**



**„Verändere Deine Welt.
Werde Landschaftsgärtner.“**



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Lebensfeindliche Städte

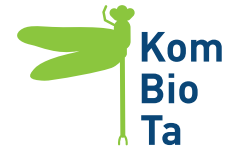


Foto: M. Koltzenburg, Bunte
Wiese Tübingen



Abbildungen der Webseite des
Bundesverbandes
Garten-, Landschafts- und
Sportplatzbau e. V.
<https://www.galabau.de/>



Foto: Steidle



Straßenbäume

- **Die GALK¹ bietet eine Liste der Baumarten und -sorten für städtischen Straßenraum**
- **Die ökologische Bedeutung spielt dabei keine Rolle!**
- **Von den 111 Arten der aktuelle Liste² sind nur 28% einheimisch & 16% aus angrenzenden Regionen**

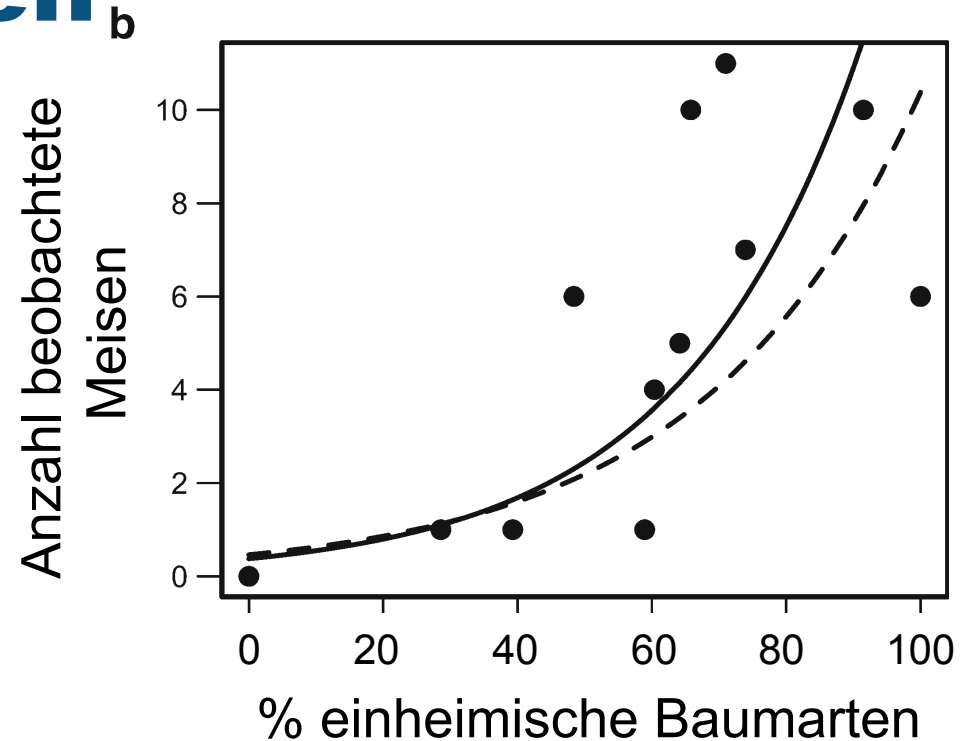
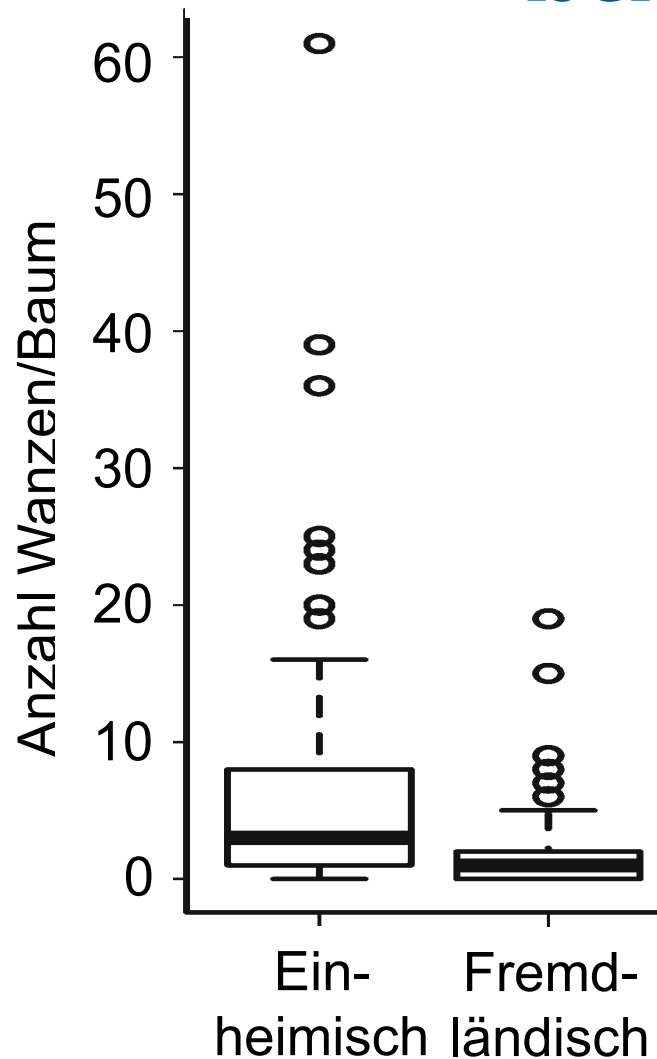
Auch Straßenbäume sollten einheimisch sein



¹GALK: Deutsche Gartenamtsleiterkonferenz: ²Liste vom 14.01.2021



Insekten an Straßen- bäumen^b



**An fremdländischen Bäumen
sind viel weniger Wanzen als
an einheimischen, und weniger
Meisen!**



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Bad Saulgauer Liste heimischer Gehölze



Bad Saulgauer Liste heimischer Gehölze

Formhecken:

Alpenjohannisbeere (*Ribes alpinum*)
Eibe (*Taxus baccata*)
Feldahorn (*Acer campestre*)
Hainbuche (*Carpinus mas*)
Kornelkirsche (*Cornus mas*)
Liguster (*Ligustrum vulgare*)
Rotbuche (*Fagus sylvatica*)

Höher wachsende Bäume:

Laubbäume:
Bergahorn (*Acer pseudoplatanus*)
Bergulme (*Ulmus glabra*)
Bergulme (*Ulmus carpinifolia*)
Flatterulme (*Ulmus pendulus*)
Hängebirke (*Betula pubescens*)
Moorbirke (*Betula sylvatica*)
Rotbuche (*Fagus sylvatica*)
Schwarzzerle (*Alnus glutinosa*)
Schwarzpappel (*Populus nigra*)
Schwarzpappel (*Populus alba*)
Silberpappel (*Populus alba*)
Silberweide (*Salix alba*)
Sommerlinde (*Tilia platyphyllos*)
Spitzahorn (*Acer platanoides*)
Stieleiche (*Quercus petraea*)
Traubeneiche (*Quercus avium*)
Vogelkirsche (*Prunus avium*)
Winterlinde (*Tilia cordata*)
Zitterpappel oder Espe (*Populus tremula*)

Bemerkung: Von der Pflanzung von Eschen sollte man momentan wegen des überall verbreiteten Eschentriebsterbens absehen.

Nadelbäume:

Rotfichte (*Picea abies*)
Waldkiefer (*Pinus sylvestris*)
Weißtanne (*Abies alba*)

Mittelhoch wachsende Bäume:

Laubbäume:
Eberesche (*Sorbus aucuparia*)
Feldahorn (*Acer campestre*, auch als Strauch)
Hainbuche (*Carpinus betulus*)
Mehlbeere (*Sorbus aria*)

Nadelgehölz:

Eibe (*Taxus baccata*)

Bad Saulgauer Staudenliste

für Kiesstreifen
(0/16er Wandkies ungewaschen)

für Schmetterlings-/ Insektengärten

heimisch

Alpen-Aster (*Aster alpinus*)
Alpen Mannstreu (*Eryngium alpinum*)
Berglauch (*Allium senescens* ssp. *senescens*)
Färber-Hundskamille (*Artemisia incisa*)
Gewöhnlicher Dost Oregano (*Origanum vulgare*)
Gewöhnliche Küchenschelle (*Pulsatilla vulgaris*)
Gewöhnliches Sonnenrischen (*Helianthemum nummularium*)
Große Fetthenne (*Sedum telephium*)
Kleine-Neiße (*Dianthus deltoides*)
Rothäuser-Neiße (*Dianthus carthusianorum*)
Kleinblättrige Bergminze (*Calamintha nepeta* ssp. *nepeta*)
Ländlicher Thymian (*Thymus longifolius* ssp. *odoratus*)
Kleiner Salbei (*Salvia sclarea*)
Königskeule (*Verbascum phoeniceum*)
Kleinblättrige Bergminze (*Calamintha nepeta* ssp. *nepeta*)
Moschus-Malve (*Malva moschata*)
Quendel (*Thymus serpyllum*)
Rosen-Malve (*Malva alcea*)
Steppen-Salbei (*Salvia nemorosa*)
Ysop (*Hyssopus officinalis* ssp. *aristatus*)
Zypressen Wolfmilch (*Euphorbia cyparissias*)

nicht heimisch

Blauraute (*Perovskia atrotanoides*)
Echter Lavendel (*Lavandula angustifolia*)
Glanz-Sonnenhut (*Rudbeckia fulgida*)
Herbstanemone (*Anemone japonica*)
Japanische Herbstanemone (*Anemone hupehensis*)
Kissenaster Augenzeiger (*Aster dumosus*)
Mexikonessel „Black Adder“ (*Agastache rugosa* „Black Adder“)
Flammenblume/Phlox (*Phlox amplexifolia*)
Roter Sonnenhut „Magnus“ (*Echinacea purpurea* „Magnus“)
Sommerflieder Davila (*Buddleja davila*)

Lehrpfad heimischer Gehölze in
Bad Saulgau
<https://bad-saulgau.de/>

<https://www.bad-saulgau.de/tourismus-wAssets/docs/natur/naturthemenpark/bad-saulgauer-liste-heimischer-gehoelze.pdf>



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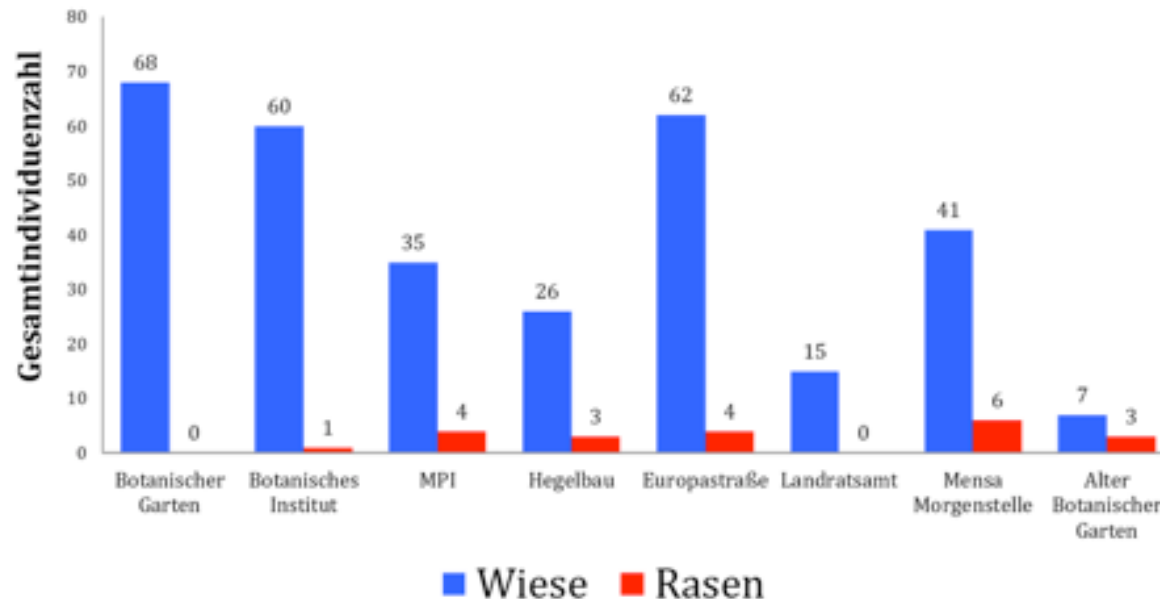
Grünflächen



Abb. Rasen auf dem Hörsaalzentrum Morgenstelle
in Tübingen (Foto: M. Koltzenburg, Bunte Wiese Tübingen)



Wiesen statt Rasen...



Auf Wiesen (2x gemäht) kommen mehr Wanzen vor als auf Rasen (8x gemäht)

Unterweger et al 2017. The influence of urban lawn mowing regimes on diversity of Heteroptera (Hemiptera). Heteropteron 48, 7–21. <https://www.buntewiese-tuebingen.de/über-uns/unsere-arbeit/>



...und statt Büschen!



Gliederfüßler in Bodenfallen



alt neu Gebüsch
Blühwiesen

Typ der Pflanzung	Mittlere Kosten (€ pro m ²)
Gebüsch	6,8
Blühwiese	1,3

**Blühwiesen beherbergen mehr
Gliederfüßlerarten & kosten weniger**

Mody et al. 2020. Flower power in the city. Plos one 15, e0234327.



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Bunter Kreisverkehr...

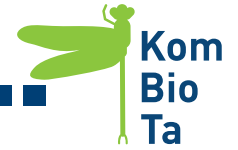
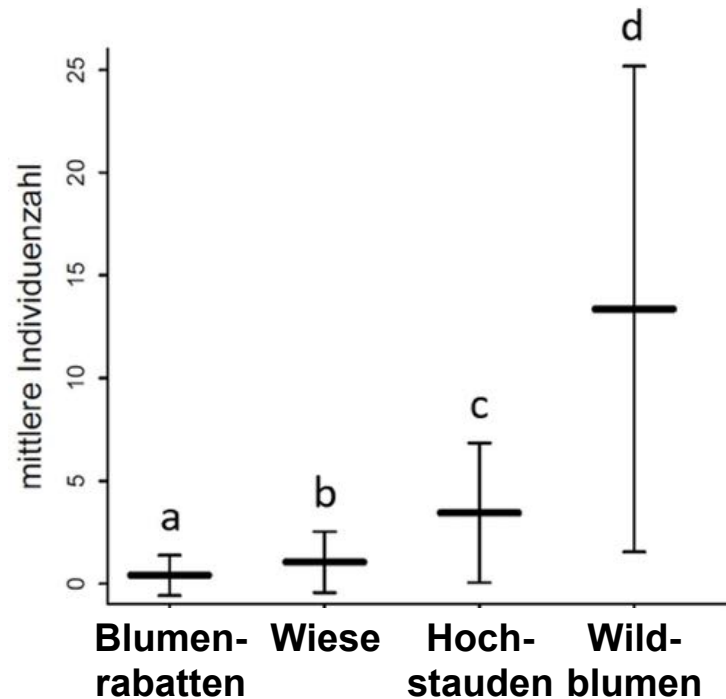


Foto: Steidle

**Kreisverkehr in Bad Saulgau,
„Landeshauptstadt der Biodiversität“**



...fördert Laufkäfer



Wildblumen erhöhen Individuen- & Artenzahlen von Laufkäfern im Kreisverkehr



Abb. aus: Landeshauptstadt der Biodiversität
Biodiversitätskonzept Kurzfassung

Sauter 2021 Diversität der Laufkäferfauna (Col., Carabidae) auf Verkehrsinseln in Abhängigkeit von der Bepflanzung. Bachelorarbeit [Universität Hohenheim](#)



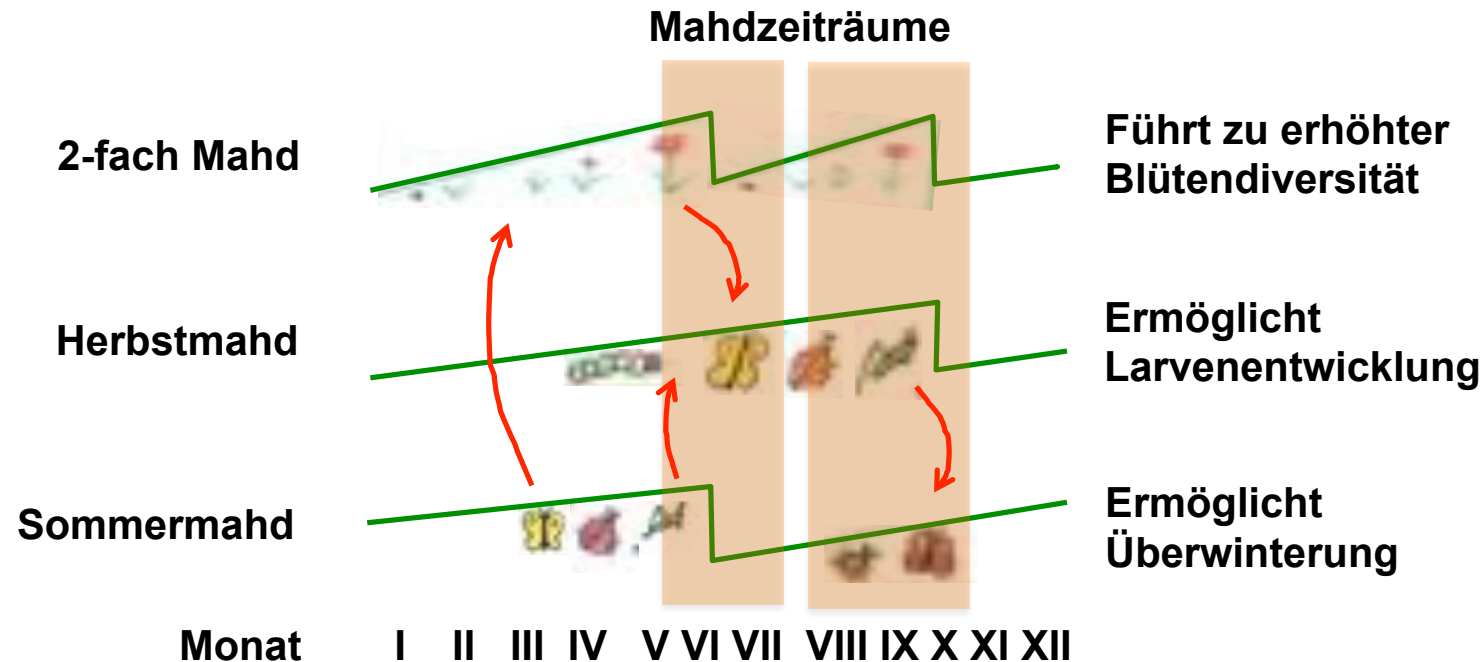
Blumenwiesen auf der Sportanlage
des SG Weiterstadt

Netzwerk Artenvielfalt im Rems-Murr Kreis mit diversen Sportvereinen

„Sport in BW“, 21, 2021, S. 34



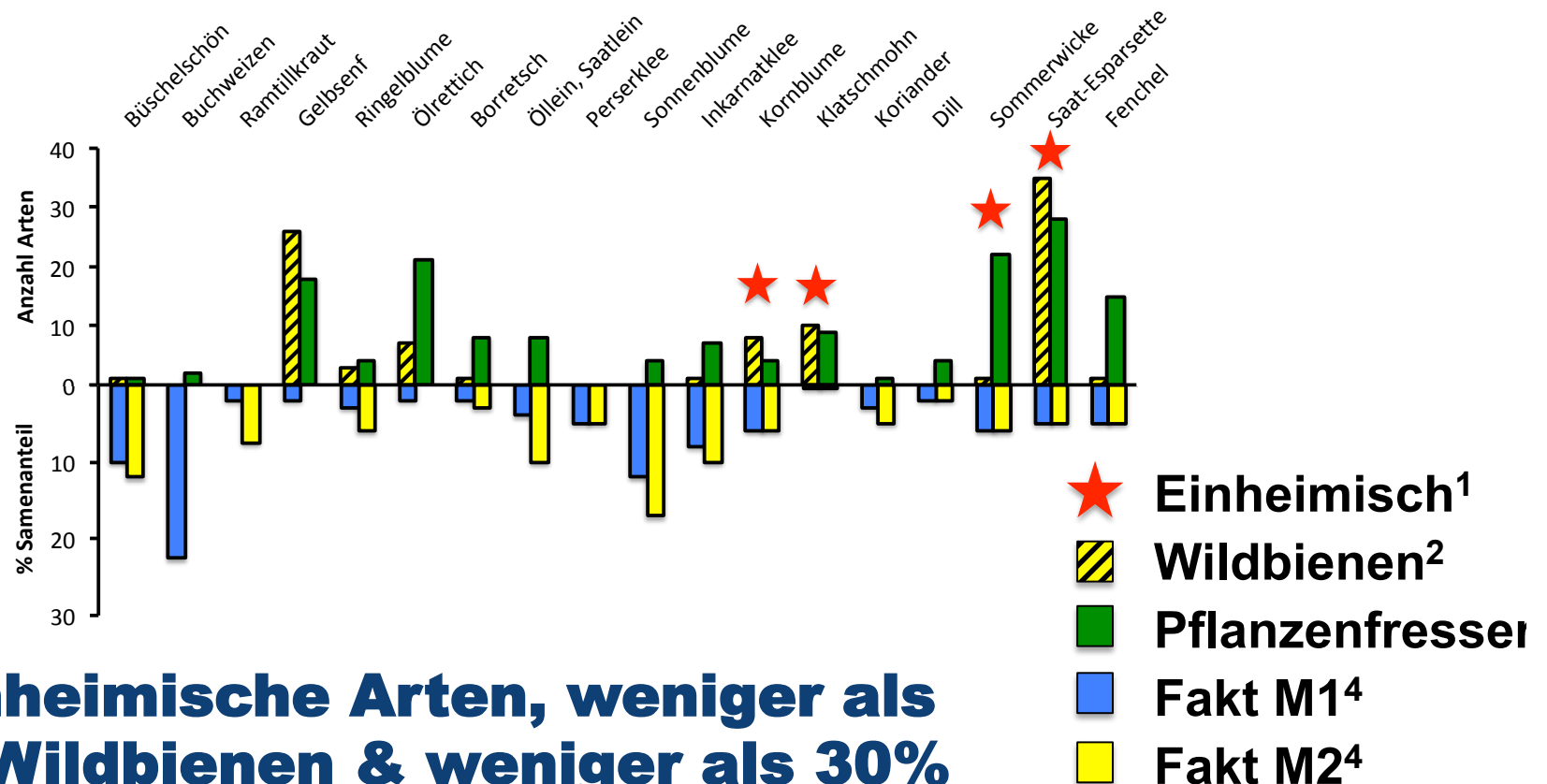
Die richtige Mahd



Flächen mit drei verschiedenen Mahdregimes erhöhen die Pflanzen- und Insektenvielfalt



Augen auf beim Samenkauf!

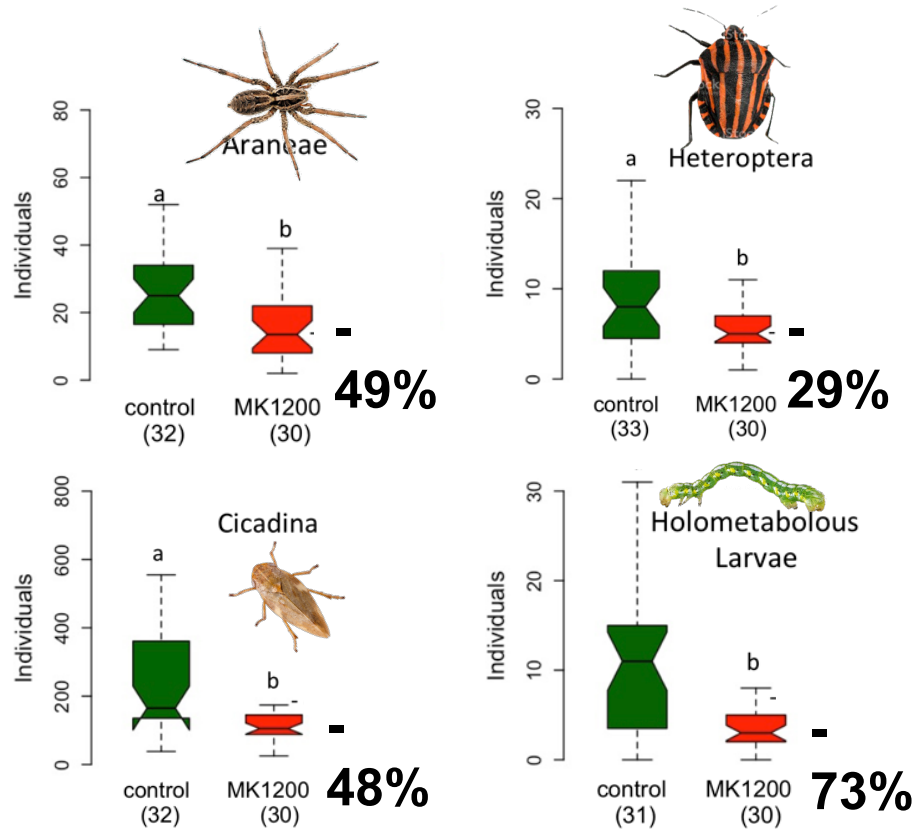


**Nur 4 einheimische Arten, weniger als
16 % für Wildbienen & weniger als 30%
für pflanzenfressende Insekten**

1: Neophyteneinstufung: www.floraweb.de (BfN); 2: Westrich 2019 Die Wildbienen Deutschlands; 3: Database of insects and plants: <http://www.brc.ac.uk/dbif/>; 4: LTZ 2020 Informationen zu ackerbaulichen Maßnahmen in FAKT



Tödliche Mahd

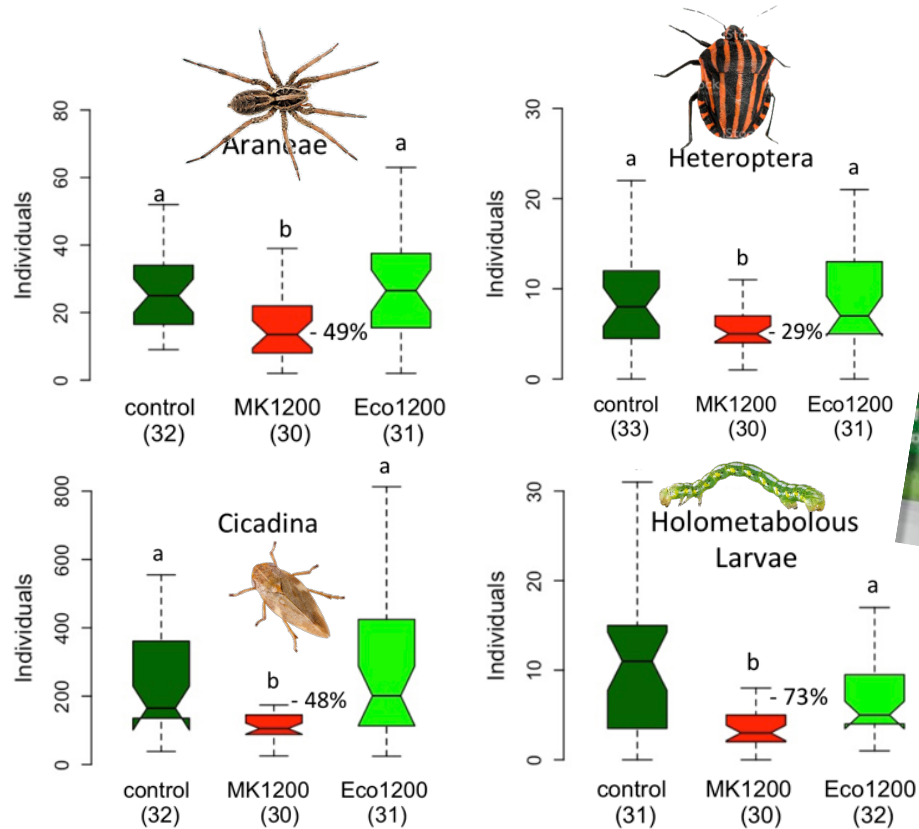


**Bei der Mahd mit konventionellen
Mähköpfen werden viele Insekten getötet**



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Insektenschonender Mähkopf



**Keine Mortalitätsverluste für manche Insektengruppen
durch insektenschonende Technik!**

Steidle et al. 2022 Journal of Applied Entomology; Betz et al. Natur & Landschaft eingereicht



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So werden Insekten gefördert!



- **Ausschließlich einheimische Pflanzen verwenden**
- **Weniger & mit insektenfreundlicher Technik mähen**
- **Insektenfreundliche Straßenbeleuchtung**
- **Bestehende Standorte erhalten statt zu erneuern**
- **Natur machen lassen!**



Brachfläche am Güterbahnhof in Bietigheim-Bissingen*



Foto: Steidle

Die meisten landschaftspflegerischen Maßnahmen zerstören Biodiversität, statt sie zu fördern!

*NABU 2013: Mehr Natur im Siedlungsgrün Biologische Vielfalt in Städten und Gemeinden

