

Centuries of habitat niche expansion reveal pervasive invasion debt in alien plants

Gilles Colling, Michael Glaser, Hanno Seebens, Bernd Lenzner, Svetlana Aćić, Fabio Attorre, Irena Axmanová, Idoia Biurrun, Gianmaria Bonari, Andraž Čarni, Maria Laura Carranza, Laura Celesti-Grapow, Milan Chytrý, Camilla Tvede Colding-Jørgensen, Renata Ćušterevska, Michele De Sanctis, Tetiana Dziuba, Klaus Ecker, Rasmus Ejrnæs, Emmanuel Garbolino, Behlül Güler, Veronika Kalusová, Gergely Király, Jonathan Lenoir, Remigiusz Pielech, Eszter Ruprecht, Jozef Šibík, Mária Šibíková, Zvezdana Stančić, Jens-Christian Svenning, Grzegorz Swacha, Kiril Vassilev, Stefan Dullinger, Franz Essl

University of Vienna · NeoBiota 2026, Brussels

Alien plants in Europe

1

One species

*Ambrosia
artemisiifolia*

common ragweed

13.5 million

people with ragweed allergies
in Europe, before biological
control

€7.4 billion

medical and lost-work costs
per year



Schaffner et al. 2020

Where next?



Human-made habitats



Grasslands

?



Forests

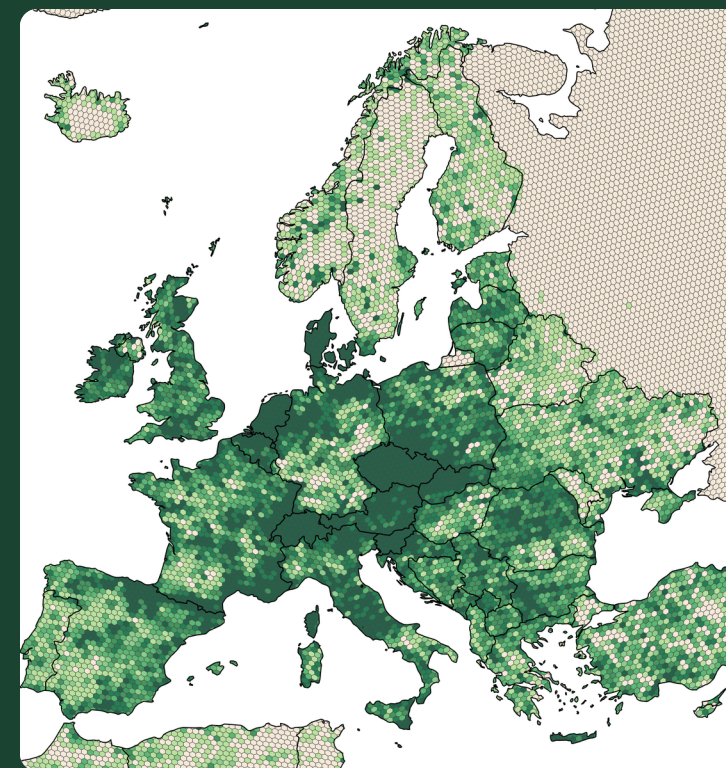
?



Wetlands

?

We tracked them



1,357

alien plant species

55

European countries

1,023,883

vegetation plots

18

habitat types



European Vegetation Archive, 1930 to
today

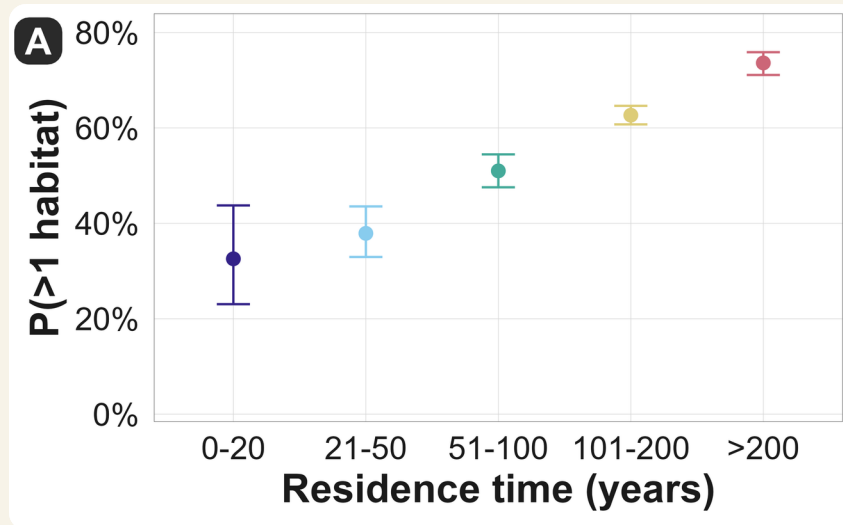
The habitat niche keeps broadening

2

More than one habitat

33% → 74%

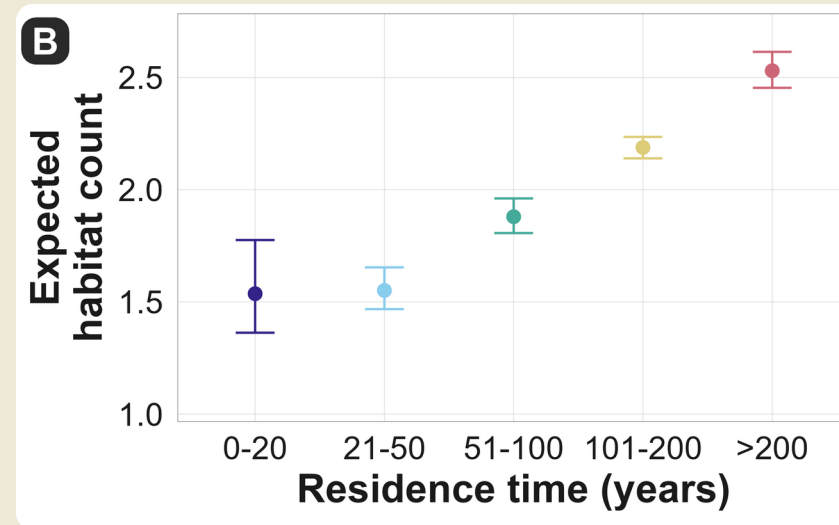
Species overrepresented in more than one habitat, from 0–20 to over 200 years of residence



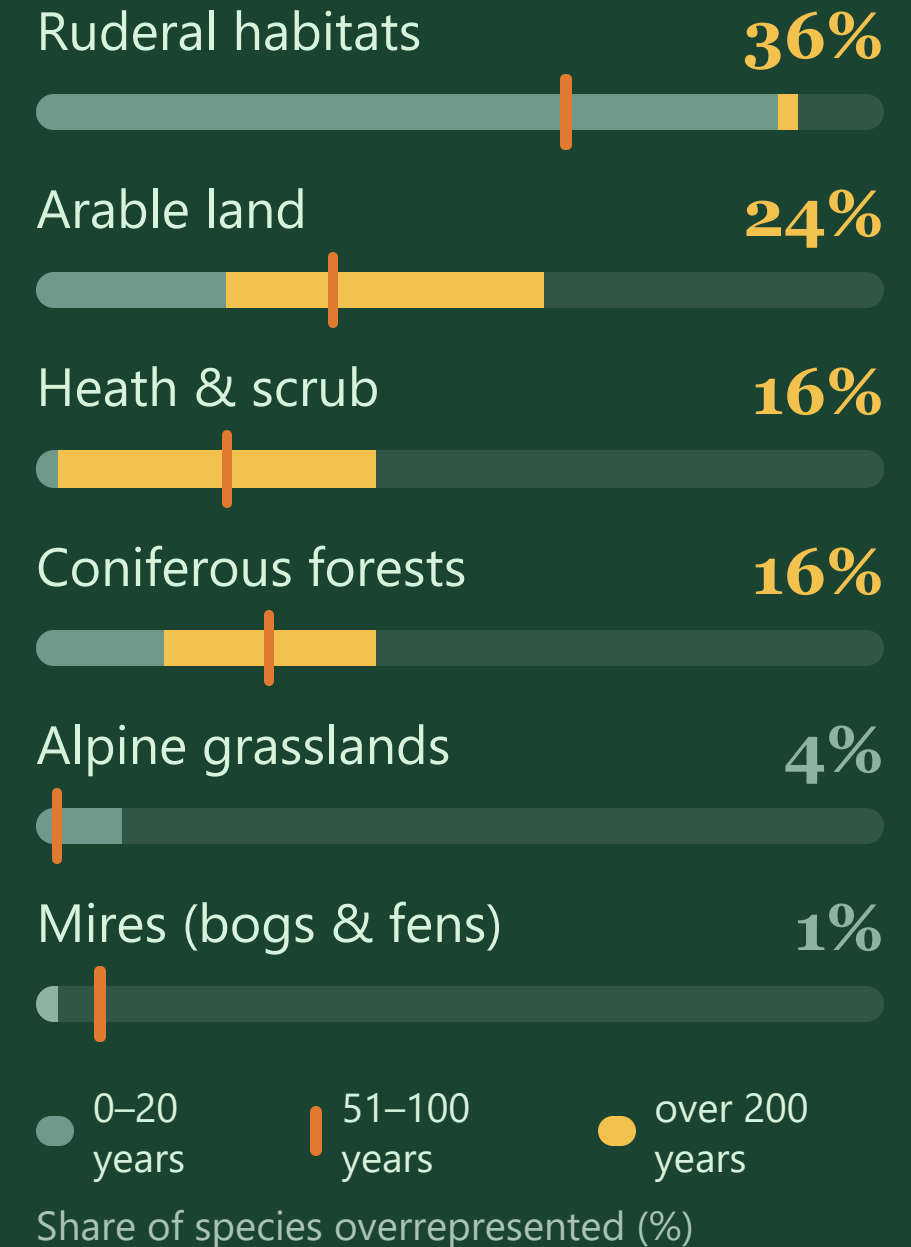
How many habitats

1.5 → 2.5

Overrepresented habitats per species over the same span, about one habitat more

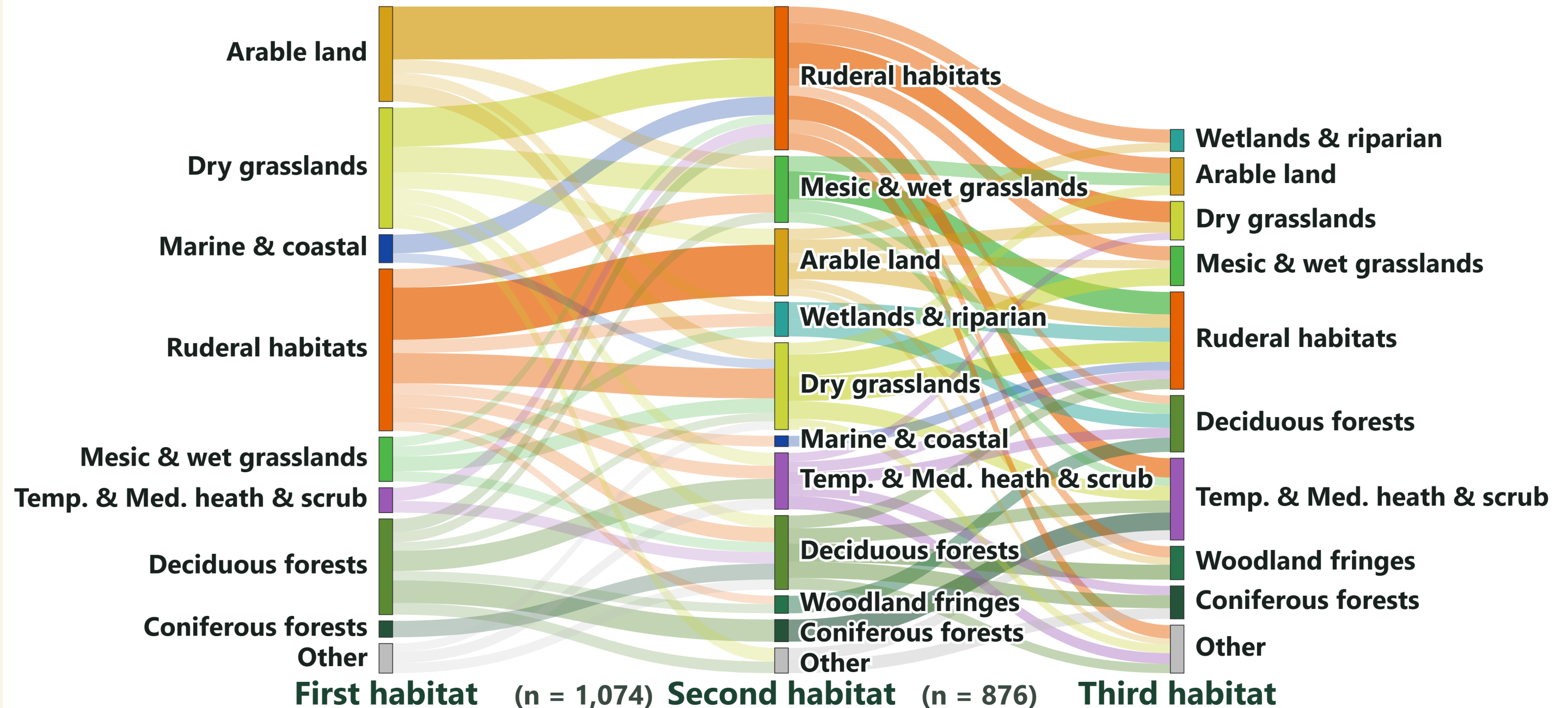


Which habitats



Ruderal habitats are the gateway at every step

3



Habitat breadth

grows with residence time: 33% → 74% overrepresented in more than one habitat

Gateway

ruderal habitats link human-made and semi-natural vegetation at every step

No plateau

the rise continues past 200 years, no sign of levelling off

Thank you

Manuscript in preparation

Gilles Colling
Department of Botany and
Biodiversity Research,
University of Vienna
gilles.colling051@gmail.com



gillescolling.com

Habitat niche breadth expands over centuries in Europe's alien flora

Gilles Colling^{1,2,*}, Michael Glaser^{1,2}, Hanno Seebens³, Bernd Lenzner¹, Svetlana Aćić⁴, Fabio Attorre⁵, Irena Axmanová⁶, Idoia Biurrun⁷, Gianmaria Bonari⁸, Andraž Čarni⁹, Maria Laura Carranza¹⁰, Laura Celesti-Grapow⁵, Milan Chytrý⁶, Camilla Tvede Colding-Jørgensen¹¹, Renata Čušterevska¹², Michele De Sanctis⁵, Tetiana Dziuba¹³, Klaus Ecker¹⁴, Rasmus Ejrnæs¹⁵, Emmanuel Garbolino¹⁶, Behlül Güler^{6,17}, Veronika Kalusová⁶, Gergely Király¹⁸, Jonathan Lenoir¹⁹, Remigiusz Pielech²⁰, Eszter Ruprecht²¹, Jozef Šibík²², Mária Šibíková²², Zvezdana Stančić²³, Jens-Christian Svenning²⁴, Grzegorz Swacha²⁵, Kiril Vassilev²⁶, Stefan Dullinger²⁷, Franz Essl¹

Vegetation-plot data: the European Vegetation Archive and every contributing database. Swiss first records: Info Flora.
With special thanks to Michael Glaser, Hanno Seebens, Bernd Lenzner, Stefan Dullinger and Franz Essl.

* These slides report the paper's updated results.